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Fig. 1.

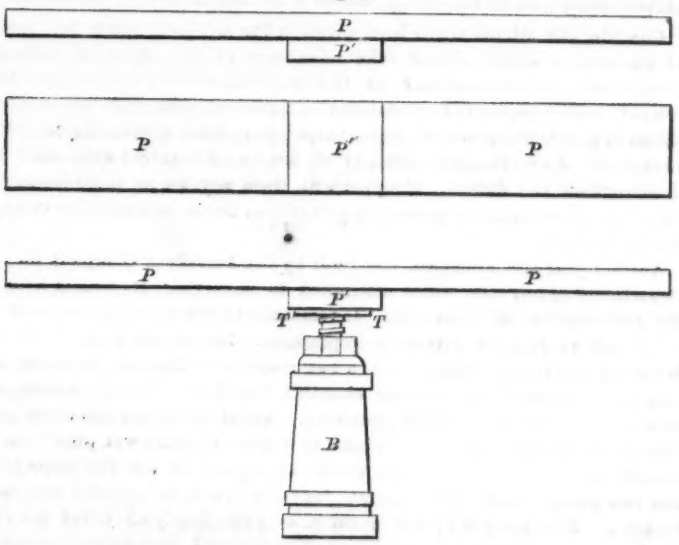
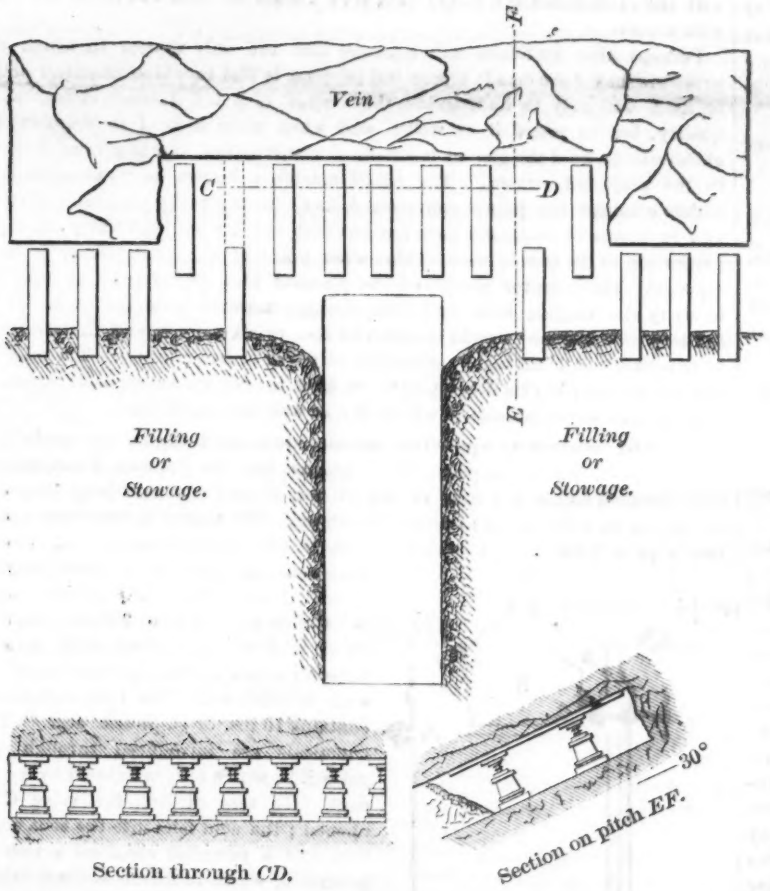


Fig. 3.

Breast Work; Vein pitching 30°.

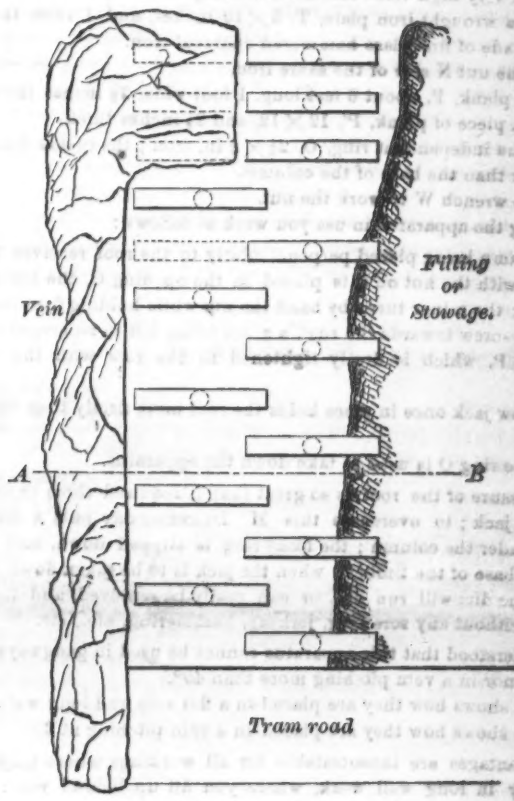


Section through *CD*.

Section on pitch *EF*.

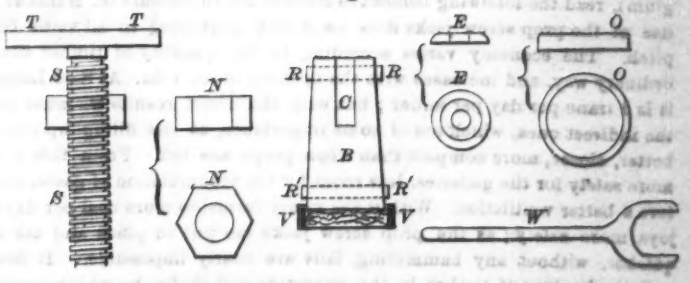
Fig. 2.

Long Wall.



Section through *AB*.

Fig. 4.



DERNENCOURT'S PROP JACK SCREW.

The Use and Advantages of the Prop Screw Jack (*vis botte.*)

By E. GAUJOT, M. E., of Philadelphia.*

In connection with the question of coal waste and economy in mining we would call the attention of those interested to an apparatus invented by M. DERNENCOURT, Superintendent of the Anzin Division of the Anzin Coal Company, North of France.

This apparatus is known in France and Belgium under the name of prop screw jack (*vis botte*), and has been used with good results in the above-named countries for some years past.

M. PONSOT gives, in his "Traité de l'exploitation des Mines," a description of

* Read before the American Institute of Mining Engineers, at the Bethlehem meeting, August 16, 1871.

it (page 533), but as the description given is old, the work not widely known in this country, and as some valuable improvements have been made since, I thought it might be useful to give a description of it, having seen it in operation in 1867, while in Europe to attend the great Exposition, and on a scientific tour to the mining districts of France, Germany, Belgium, and Italy.

The prop screw jack is composed of the following pieces:

I. The body, or column B, Fig. 4, of oak or yellow pine, sawed square, the bark taken off, and any length, proportionate to the vein. The smallest are 10 inches diameter at the base, and 9 inches at the top, the height being from 12 to 15 inches less than the size of the vein. In the axis of this column, and at the top end, is a cylindrical opening or hole, C, 2½ inches diameter, 10 inches deep, for the screw, S.

II. Two wrought-iron rings, R R, to strengthen the two extremities of the column; the rings must be put on hot.

III. A cast-iron washer, E, with hole in center a little larger than the screw, to be put on the top of the column, and on which the nut is to rest; the top side of this washer must be faced on the lathe, also the bottom of the nut, to prevent friction.

IV. The screw S having a total length of 12 inches and a diameter of 2½ inches (for very high veins this diameter may be increased to 3 inches), and has on its top a wrought-iron plate, T, 5×10 inches, and 1 inch thick; the screw must be made of first-class hammered charcoal iron.

V. The nut N also of the same iron.

VI. A plank, P, about 6 feet long, 1 foot wide, 2½ inches thick.

VII. A piece of plank, P', 12×12, and 2½ inches thick.

VIII. The independent ring, O, 2½×¾ in. iron; the inside diameter must be ¾ in. larger than the base of the column.

IX. The wrench W to work the nut.

To bring the apparatus in use you work as follows:

The column being placed perpendicularly to the roof receives the washer E; the screw with the nut on it is placed in the opening C, the nut resting on the washer E; the miner turns by hand the nut while holding firm the screw, which brings the screw towards the roof, a space being left to receive the planks P' and the plank P, which is firmly tightened to the roof with the wrench. See Fig. 1.

The screw jack once in place holds the roof more firmly than the usual way of timbering.

The loose ring O is used to take down the apparatus.

The pressure of the roof is so great that it required three or four men to unscrew the jack; to overcome this M. DERNENCOURT puts a dirt mattrass or cushion under the column; the loose ring is slipped down, and holds the dirt under the base of the timber; when the jack is to be taken down the ring being lifted up the dirt will run out, or can easily be removed, and the apparatus is loosened without any screwing, jerking, hammering, etc., etc.

It is understood that this apparatus cannot be used in gangways or permanent openings, nor in a vein pitching more than 40°.

Figure 2 shows how they are placed in a flat vein and long wall.

Figure 3 shows how they are placed in a vein pitching at 30°.

The advantages are incontestable for all workings where they can be used, particularly in long wall work, where you fill up behind you; the filling or stowage where the jacks are used is safer, better, and done quicker than with the common timbering, as it leaves the whole space open, having no props in the way.

M. FAYES, at the mines of Bernissart (Belgium), after having used them for several months, gives the following account: "The economy realized during the month of April is 1 franc 25 centimes per miner per day. In the ordinary way of timbering the miner spent one-fifth of his day in preparing the timber and putting it in place; by this new method it is reduced to one-tenth; therefore one-tenth more of his time can be employed in cutting coal."

M. CORNET, the well-known director of the mines of Sars Longchamps (Belgium), read the following before the Société des Ingenieurs du Hainaut: "The use of the prop screw jacks does away with timbering in all veins below 40° pitch. The economy varies according to the quantity of timber used in the ordinary way, and increases with the opening of the vein. At Sars Longchamps it is 1 franc per day per miner; but with the direct results we must not forget the indirect ones, which are of some importance, as the filling up can be done better, closer, more compact than when props are left. From this will result more safety for the galleries, less room for the accumulation of gases, and therefore a better ventilation. With it the miner furnishes more coal per day and enjoys more safety; as the prop screw jacks are put in place and taken down quicker, without any hammering, falls are nearly impossible. It does away with the hauling of timber in the gangways and shafts, by which considerable time is lost. At Sars Longchamps (where both methods of timbering are in use in different gangways) the results have been to furnish the coal from the chambers with prop screw jacks, one half hour sooner at the bottom of the shaft than the coal from chambers in which the old way of timbering is in use. To conclude, I would say that experience has shown, in the apparatus invented by M. DERNENCOURT, the following advantages: Economy in timber, greater security for the miner, to lessen the quantity of rubbish to be extracted, to give the miner more time for cutting coal."

Polytechnic Branch of the American Institute.

MR. DANIEL J. TAPLEY, at the meeting, January 31, read the following paper on a new adaptation of the chemical method of extinguishing fires:

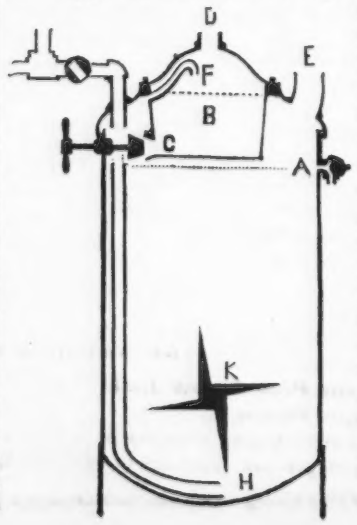
The alarming frequency of fires within the last few months has awakened an unusual interest, and provoked a deal of newspaper discussion, as to the best means of *preventing* and *extinguishing* conflagrations. The lesson of the Boston fire is one that has been often reiterated but seldom heeded—namely, that after a fire reaches a certain stage, it gets beyond the control of any apparatus whatever, and takes, for the most part, its own course. Any attempt at improvement in our present system should be in the direction of a greater promptness in extinguishing incipient fires, as that is the peculiarly weak point of the apparatus in use. The main point aimed at in the construction of engines heretofore, has been the throwing of the largest possible bulk of water, rather than the instantaneous action which would quench fires in their inception. The result has been an enormous increase in the item of water damage, without a proportionate gain in the *celerity*, which is the real element of success at fires.

Considerable attention has been given in the last few years to the production of an engine which should take advantage of the supposed extinguishing properties of *carbonic acid gas*—as this material seemed to promise the condensed power requisite to portability in transportation, with the utmost expedition in generating pressure and manipulation, while presenting the additional advantages of avoiding the necessity of flooding a building with water in order to extinguish the flames. Coupled with these advantages there seemed to be a *certainty of action* and a marvelous power over flame, unattainable by any other known method.

About a year ago an engine was built by the Amoskeag Company for the Fire Department of our city, which attempted to impregnate its stream with gas, by the introduction of chemicals. It remained in the department about a year, but failed to make a favorable impression. In a recent number of *Harpers' Monthly* a description was given of a new machine in London, in which carbonic acid gas, evolved from burning charcoal, was forced into its stream, and the results were spoken of as very gratifying. About four years ago a company was formed at Newton, Mass., of which Governor CLAFLIN was president, for the manufacture of a hand-engine which attempted to use the same principle The two pumps drew from separate tanks, which were supplied with water by buckets. A man stood by the machine, who constantly shovelled bi-carbonate of soda into one tank, and tartaric, or other dry acid, into the other—the theory being that when the two came together in the air-chamber or hose, enough of the chemicals would be dissolved to generate the gas and impregnate the stream with the extinguishing quality. For some reason the idea was never developed with success.

Perhaps this audience will concede that the only system in which this principle has been made a practical success, is that in which chemical action is used not only to impregnate the stream with the desired extinguishing quality, but to *propel it* as well; and when *water* is used to dissolve the chemicals, to hold the gas in mechanical combination, and to give momentum to the projected stream. The small machines, known as "extinguishers," which combine the points enumerated, have made a really creditable history, and in scores of instances have put out fires which were apparently out of all proportion to the means used. The weak point of the extinguisher is in its *capacity*. The inventor conceived the pleasant idea of forcing the operator to carry the engine, hose and extinguishing material upon his back. This limited the practical weight to about 88 lbs., or six gallons, and the stream to to one-sixteenth of an inch, continuing only four or five minntes. The *principle* was a good one, but its development seemed to call for a *continuous* stream of such volume as would control a large fire as well as a small one.

The first attempt to apply this principle to a street engine was made by a Northampton, Mass., company, whose engine, like the Babcock Extinguisher, uses chemical action not only to impart the highest extinguishing property, but to generate the power to propel its stream. The engine is constructed with two copper tanks, tested to a high pressure, and mounted on wheels. One of these tanks is shown in the accompanying figure. Its capacity is fifty gallons, and it is tested to a pressure of 200 lbs. Each of these is filled by a guage-cock A, with water in which 20 lbs. of bicarbonate of soda is dissolved. The lead chamber B contains 10 lbs. of sulphuric acid. The chemicals are introduced through the gates E D, which are then closed by screw-caps. In case of fire, the valve C is opened; the acid falls into the soda solution, and a powerful chemical action is generated, which in fifteen seconds raises a pressure of 200 lbs., and the steam is forced through the pipe H into the main I, leading to the different floors of the building. The tendency of the rising pressure to force back the acid in a counter current, is corrected by the equalizing tube F. The agitator K, for



facilitating the dissolving of the soda, is worked by a crank-shaft through the side of the tank.

One hundred and fifty-feet of one-inch rubber hose is rolled in such a way that the coupling is always connected ready for instant action, and the stream—of thirty-six times the volume of the Babcock Portable—is thrown 100 feet from the nozzle. Each tank is nearly filled with a solution of bi-carbonate of soda, while a chamber in the top holds the complement of sulphuric acid. On arriving at a fire, a valve is opened which lets the acid fall into the soda solution, and in fifteen seconds the guage shows a pressure of 200 lbs. In the meantime the hose is run off, the gate opened, and in less than a minute after the machine stops at the burning building the stream is on the fire. This celerity of action is due not merely to the instantaneous generation of power, but to the fact that no suction-hose has to be put down, and no leading-hose laid for connection with reservoirs or hydrants. The result of this promptness, together with the marvelous extinguishing power of the material used, is, in a majority of cases, the putting-out of the fire before it is fairly started. Statistics prove that eight times in ten fires are discovered in the earliest stage, and the fate of the building is usually decided by the action of the first ten minutes.

Thus far the machine has been introduced into the departments of some fifty towns and cities, and has made such a record as no other apparatus has even approached. At Holyoke, Mass., the "Self-Acting Engine" was adopted in May, 1870. The town was already supplied with two steamers, two hand-tubs, an acqueduct with 70 feet head, and plenty of hose companies. Since its adoption 19 fires have occurred, 13 of which have been put out by the "Self-Acting" before a stream could be even *started* from any other source. At many of these fires the engine has shown an efficiency little short of the miraculous. Again, there is no town which is supplied with the engines but has reduced its fire losses to less than fifty per cent. of the average loss in previous years. At Holyoke, from January 1 to May 1, *three* fires occurred, with a loss of $375,000. On the 10th of May the new engine was used for the first time, and from that date to January 1, 1871, *six* fires occurred, with a total loss of $1,665. At Danvers, Mass., during one year from its introduction, four fires occurred with a total loss of $875, or an average of $219 to each fire. This is less than a fifth of the average loss in previous years, and less than a twentieth of the average loss of Essex County for the same years. It saves the first building in nearly every case, and in a large majority of instances almost without fire damages. A still more astounding claim is, that out of 250 fires heard from, in no single instance has a second (detached) building been burned. At Westfield, the organ factory of W. A. JOHNSON was thoroughly on fire when the engine arrived from a distance, two dwellings were already caught, and during the conflagration two others were ignited, but the single "Self-Acting" handled the four fires at once, and saved all the dwellings—not playing on the factory, which was really gone before its arrival. At Holyoke, the Whiting Paper Mill—the largest in the world—was afire at a point 85 feet from the ground, during a gale of wind, and was put out by the engine before the steamers could get to work.

Among the peculiarities to which the machine owes its ability to achieve such unmistakable results, its simplicity seems worthy of notice. It is simply a tank and faucett. The machine is easily managed, cannot be got out of order, and costs nothing for repairs. It has been used at actual fires, under every variety of circumstance, with a thermometer ranging from 98° to —10°, and never has failed to throw its stream. Its portability is another important feature. Half-a-dozen men can draw and work it, and its light, pliant hose can be carried up stairways, or ladders, or upon roofs, with much greater facility than the ordinary hose. In point of economy, its cost is less than a tenth of that of a steamer, with its compliment of hose, reservoirs, horses, harness, etc., and the running expense is very trifling.

It was originally intended for, and has been mainly introduced in country towns, but it has proved a success in cities as well. In supplying cities the engines should be put in at shorter distances apart than the steamers (as its cost will allow), which would give it the advantage of a shorter travel, as well as a more ready manipulation. This would enable it to always get its stream on first, and in most fires to extinguish the flames without damaging the building with water by the steamer, to the great advantage of the insurance companies and owners.

In Canada there are about 100 miles of wooden railroads in successful operation. The gauge is 8ft. 4½in., and the speed is about sixteen miles an hour, though higher velocities have been attained without trouble. The rails are of maple—a close firm wood—7in. deep by 4in. wide, and notched into the cross sleepers, which are 8in. square, and 20in. apart. The cost of these roads is said to be about £1,400 a mile as a maximum, and the rails last from two to four years. These lines are in the neighborhood of Quebec.

Mr POOLE, Inspector of Mines, exhibited at a meeting of the Institute of Natural Science, Halifax, a specimen containing the remains of a rodent, probably a ground squirrel, encased in lead ore taken from a vein in the limestone of Lyon Hill. The discovery of remains so modern in so unusual a position as a mineral vein clearly demonstrates the changes which the constituents of veins undergo at the present time, when the surrounding conditions are favorable for change.

Reactions of Certain Minerals and Rocks at a Very High Temperature.

BY DR. L. ELSNER.

The reactions of the minerals and rocks at a very high temperature are of the highest interest, not only in a purely scientific, but more especially in a technological point of view. I have exposed, therefore, a series of minerals and rocks to the high temperature of a porcelain furnace, a method of proceeding, which I adopted some time ago with the most familiar metallic oxides, in order to prove their volatibility at a high temperature. The minerals and rocks in question were pulverized and then put in unglazed porcelain dishes. These dishes and their contents were again placed in a seggar, closed by a lid, and so brought into the hottest fire of the porcelain furnace. The temperature attained during these experiments was found by several tests to be from 2,500 to 3,000° C.

The minerals follow in alphabetical order; the rocks as nearly as possible according to their geological relations.

The results are the following:

I. MINERALS.

I remark at the outset, that I have intentionally omitted localities of the several minerals, since I have found, that specimens of the same mineral from the most different regions of the globe, which I have exposed to a high temperature, have always given the same result.

Almandine, dark red crystals; silicate of alumina and silicate of the protoxide of iron as mono-silicates had melted in the furnace to a fluid, reddish-brown mass; this mass had penetrated the porcelain-vessel, containing it.

Crystal, (limpid quartz)—transparent, clear, colorless pieces—had not melted in the furnace, but had assumed a dull, milk-white color. Therefore to be set down as entirely infusible.

Epidote, (pistacite)—dark, green fragments of crystals—silicate of the protoxyd of iron, silicate of lime, and silicate of alumina as monosilicates—had melted to a fluid, glassy, brownish black mass, which had penetrated the porcelain vessel.

Feldspar, in flesh-colored pieces, silicate of potash and silicate of alumina as tri-silicates—had melted in the furnace to a white enamel-like mass. According to analyses by HAYES, the chemical composition of the feldspar was *not* altered by smelting.

Mica, (bi-axial,) Tri-Silicate of potash with monosilicates of the peroxyd of iron and alumina, containing lithia; bronze-brown, tabular fragments of crystals; had melted to a dense, black, pitch-like substance.

Hornblende, (Tri-Silicate of lime with bi-silicate of protoxyd of iron and magnesia;) dark, greenish-brown fragments of crystals; had melted to an olive-brown mass.

Lepidolite (bi-axial mica,) peach-blossom colored, crystalline pieces from Moravia. They had melted in the furnace into a colorless, transparent, glassy mass. The coloring peroxyd of manganese was transformed into the colorless protoxyd of the same metal.

Pargasite (variety of hornblende,) small, sea-green, transparent, crystalline pieces, had melted into an olive-yellowish mass.

Actinolite (variety of hornblende,) dark, green, crystalline pieces, had melted into a brownish, olive-yellow mass.

Topaz (silicate of alumina with fluoride of aluminium and alumina) from Brazil and Saxony, (monosilicate,) clear, yellowish, transparent, columnar fragments of crystals. The pieces had not in the least melted, even after being twice exposed to the hottest fire of the furnace; they had, however, lost their transparency entirely, and become throughout a dull, chalky white; they are consequently to be set down as infusible. Topaz from the most widely different regions, even Pycnite, behaved in the same way.

Tremolite (silicate of lime and magnesia,) free from iron, white, compact, crystalline, radiated. The mineral only melted into an opaque, white mass, on being exposed a second time to the heat of the furnace.

Tourmaline, crystalline, (Alabaschka,) black, melted into a brown mass.

Tourmaline, crystalline, (Andreasberg,) black. Same as last.

Tourmaline, red, from Elba, not melted, even in the hottest fire, only sintered to a reddish-white mass. The oxyd of iron of the black tourmaline evidently increases its fusibility.

Vesuvian (Egean,) silicate of lime and magnesia, with silicate of alumina and silicate of peroxyd of iron, as monosilicates—crystalline, brown pieces. They had melted into a fluid, brownish, glassy mass, which had penetrated the porcelain vessel.

Wollastonite, silicate of lime, as bi-silicate (free from iron)—white, radiated, crystalline pieces—melted only after a second exposure to the hottest fire in the furnace into a yellowish-gray and transparent mass—a similar reaction to that of Tremolite; this mineral may be pronounced fusible only with great difficulty.

Zoisite (silicate of lime with silicate of alumina, as monosilicates,) crystalline pieces; melted in the furnace into a dense, gray mass, with some dull, white segregations (quartz.)

As a general result of the above experiments, we may set down that the alkalis and the protoxyd and the peroxyd of iron increase the fusibility of the silicates, while predominating alumina (topaz,) as well as the absence of oxyds of iron (Wollastonite, Tremolite,) decrease it.

II. ROCKS AT A HIGH TEMPERATURE.

The reactions of rocks at a high temperature may be foretold from those of

their mineral constituents and this *a priori* reasoning is confirmed by experiment.

The rocks examined were the following. The experiments were conducted in a similar way to the foregoing.

PRIMITIVE ROCKS.

Granite, from difficult localities, (mixture of quartz, mica and feldspar;) the quartz mostly columnar, mica tabular, feldspar partly crystalline, flesh-colored, partly decomposed. Granites from different regions had melted in the furnace to a mass, which consisted mainly of melted feldspar, with brown spots of melted mica. The entire melted mass was filled with dull, white segregations of quartz.

Gneis (quartz, mica and feldspar) from different localities; had melted into a dense, pitch-black, glassy mass, reddish brown on the surface. Some samples showed in the melted mass clearly defined parallel dull-white segregations of quartz.

Mica Slate from different regions (mica and quartz) melted to a reddish brown mass, inside black, with greasy lustre, and filled with dull, white stripes of quartz.

Coal Slate from the lower Silesian coal measures. Melted into a reddish brown mass, porous inside.

Planer-Sandstone (containing lime) melted into fluid, greenish-grey, clear glass.

Keuper-Sandstone, melted into a yellow-brownish mass, with glassy lustre, porous inside.

Gabbro, crystalline mixture of brown diallage and dense labrador, melted into a glassy black mass.

Lime-Slate, melted in the furnace to a mass, reddish-brown at the surface, inside dull, olive-brown and full of bubbles.

Grey, Red and Black Pitch-Stone (composition similar to albite) in compact pieces. Melted in the furnace into a whitish grey, enamel-like, dense mass.

Hornblende-Rock, compact, black, crystalline pieces, melted into a black, glassy mass.

VOLCANIC ROCKS.

Basalt, from different regions, melted in the furnace to a pitch-black, dense mass of greasy lustre.

Pumice-Stone (Lipari) melted to a greyish-black glassy mass, similar to Obsidian.

Dolerite, melted to a black mass, glassy and reddish brown on the surface.

Lava (Vesuvius, Torre del Grecco), dense grey rock, having crystals of augite disseminated through it. Melted in the furnace to a reddish-brown mass with greasy lustre.

Obsidian (Lipari, Mexico,) pitch black rock with glassy lustre; melted to a black, glassy mass, having the same appearance as the obsidian used for the experiment.

Porphyry (feldspar and augite porphyry):

1. *Feldspar-porphyry*, melted to a white mass, very similar to feldspar, covered on the surface with brown spots, the interior filled partly with dull-white segregations of quartz.
2. *Augite-porphyry* (melampyr) melted in the furnace to a reddish-brown glass.

Phonolite (clink stone) from different regions, melted to a throughout black, glassy mass, with greasy lustre.

Trachyte (from Drachenfels) melted to a dense, black, glass-like mass.

It is of the highest interest in a scientific and, more particularly, in a geological point of view, that all the rocks, submitted to the above tests, even those belonging to the truly volcanic series, excepting only obsidian, assumed an appearance entirely different from that natural to them. The crystalline minerals, for instance in granite, mica, &c., were entirely destroyed by the agency of a high temperature, everything being melted into a compact mass; the origin of these rocks, even of the volcanic, must therefore have taken place under very peculiar circumstances, which this is not the place to discuss. Of equal interest is the change, after smelting, of pumice-stone into a glassy mass, similar to obsidian. It appears to favor the theory that obsidian is formed from pumice-stone at a high temperature. The observation also deserves prominence, that in all silicates, which contain besides the silicates free quartz, the latter is always to be recognized in the melted and cooled mass as a dull-white segregation.

I should not omit to mention that Prof. RAMMELSBERG kindly furnished me with a number of minerals and rocks for these investigations; and also instituted experiments with some of the products, which will add interest to the above statements. The results of his examination are given below.

The tests of RAMMELSBERG as a whole confirm the well known experience, already gained by MAGNUS, BISCHOFF, DEVILLE, and others, that after an exposure to a high temperature minerals show a smaller specific gravity than before. Especially noteworthy in this connection is the illustration of the same principle, afforded by the specific gravities of porcelain, when subjected to the first or baking heat, and to the finishing heat of the furnace. Notwithstanding the shrinkage—in other words, the lineal contraction—of the porcelain in the latter process, its specific gravity is actually diminished. For example

The once-baked porcelain of Sevres (in pulverized form) has a specific gravity of	2.617
The same after final heat	2.242
The once-baked porcelain of the Berlin Manuf. (in pulverized form	2.613
The same after final heat	2.452

Dr. RAMMELSBERG remarks on the foregoing dolmastic experiments:

I. MINERALS WHICH MELT WITHOUT ESSENTIAL LOSS OF VOLATILE CONSTITUENTS.

	Specific gravity — Before heating.	After heating.	
Quartz, mine "Churprinz' coarse powder	2.5—2.7	2.404	Not melted, white opaque.
Orthoclas, a, Adular, Gotthardt	2.5—2.6	2.346	Translucent glass, full of bubbles.
b, common feldspar		2.238	Translucent glass, full of bubbles.
c, Sanidin (Drachenfels)	2.6	2.381	More translucent.
Albite (Periklin) Zillerthal.	2 604	2 041	Adular.
Oligoclas (Ytterby)	2 6	2.258	do.
Labrador (from Labrador).	2.6—2.7	2.504	White translucent, glass.
Obsidian, black Mexico, giving the same specific gravity before and after heating.			Dark transparent glass.
Pumice-stone (Lipari)			Greenish, partly clear glass, partly full of bubbles.
Pearl-stone			Transparent, clear glass, full of bubbles.
Pitch-stone, Meissen, a, green			Cloudy, white glass, bubbles.
b, black			White glass, full of fire blisters, with segregations of quartz.
Olivin, green (Tyman)	3.3—3.4	3.1c3	Greenish glass.
Wollastonite (Finland)	2.85	2.848	Crystalline mass.
Tremolite, Gulpoe	3.238	3.003	Do. of the form of augite.
Actinolite, Arendal, Zillerthal,			Greenish brown crystalline.
Hornblende, Bohemia, black, Arendel. Frederikswall. Paregas. Mamon.			Black and dark green, stony mass, glassy in some places.
Zoisite, Fichtel Mts.			Grey, stony.
Garnet, a, Almandin, Hungary			Black glass
b, Pyrope, Bohemia	3.70	3.144	Black, stony.

2. MINERALS WHICH LOST FLUORINE (FROM $SiFl_2$) AND PARTLY HO.

Mica, a, white, Bengal			Brown, stony.
b, black, Greenland			Black.
c, white, lithia mica, Zinerwald			
d, Lepidolite, Rozena.	2.8—3.0	2 418	Transparent, clear glass, free from fluorine, easily decomposed by HC.
Tourmaline, a, black, Alabaschka			Black, stony mass
b, Andreasberg c, reddish, Elba			white, opaque.

	Loss.
Topaz, from Finbo	22.98
" Saxony	20.73
" Altenberg (Pycnite)	19.98
" Schlackenwald	17.73
" Trumball	16 27—16.4 to 19.55
" Brazil	14.1 —15.4

Topaz does not melt, but is transformed without smelting and losing its original form into a dull white, opaque silicate of alumina, spec. grav. 3 00, which contains no fluorine. The loss of weight being, according to FORCHHAMMER and DEVILLE, 23 per cent., new experiments in the porcelain-furnace will be necessary. [They have been made since and have confirmed the above results.—ELSNER.]

3 ROCKS,

Granite, dark glass, with bubbles, and filled with white particles of quartz

Gneiss, black glass; the quartz accumulated in its upper part.

Mica-slate, as before.

Talc-slate, greyish green, stony mass.

Trachyte from Drachenfels, black glass, transmitted light brown.

Phonolite from Teplitz, black glass, full of bubbles.

Dolerite, black glass.

Keuper-sandstone, yellowish glass, full of blisters and particles of quartz.

In the meeting of the Geological Society of April 5, 1865, RAMMELSBERG made the following additional communication:

"In regard to their reactions in smelting, the minerals can be brought into two groups, relative to the constancy of their chemical composition, or a change of the same, as, for instance, topaz, lepidolite; the minerals melting unchanged generally pass to an amorphous state, their specific gravity changing at the same time; a few minerals, like corundum, augite, and especially wollastonite keep their crystalline forms, most generally those which are peculiar to them; only in case of hornblende (especially of tremolite) the form is changed into another one (into that of augite), its density increasing during the process. The rocks experimented on showed a diminished specific gravity after melting. This decrease is, however, less considerable than should be expected, according to the reactions of their constituents.

THE COAL TRADE.

NEW YORK, February 22, 1873.

Trade has not increased to any extent, though some of our contemporaries have represented it as lively. Our own information does not show any noticeable departure from the quietness usual to the season. Prices as a rule remain unchanged this week, though the Pennsylvania Company has altered its list to conform to the rates current among other companies. Its prices (to contractors only) are for coal at Weehawken.

Lump	$4.50
Steamer	4.50
Grate	4.50
Egg	4.70
Stove	5.00
Chestnut	4.40

Circular No. 1 of the Philadelphia Coal and Iron Company reads as follows:

The Philadelphia & Reading Coal and Iron Company desire to call the attention of retailers, manufacturers, and consumers to the coals from the following collieries now worked by them:—

Pine Forest,	Preston, No. 2,
Tunnel,	Wabash,
Keystone,	Locust Spring,
Pine Knot,	East Franklin,
Glendower,	Bast,
Ellangowan,	Potts,
Preston, No 1,	Beechwood,
Shaft, No. 1,	Thomaston,
Live Oak,	Forestville,
Phœnix Park, No. 2,	Boston Run,
Rainbow,	Preston, No. 4,
Merriam,	Buckville,
Indian Ridge,	Cedar Hill,
Mine Hill Gap,	North Franklin No. 1,
Otto,	North Franklin, No. 2,
Knickerbocker,	

In addition to the product of the above, they will sell, as factors, during the season of 1873, all of the coals from the following well known collieries that are either shipped from Port Richmond or consigned through the Delaware & Raritan Canal:

Tunnel Ridge,	Glentworth,
Lawrence,	Enterprise,
Wm. Penn,	Big Mountain,
Girardville,	Brookside,
Union,	Bear Run,
Manchester,	Shenandoah,
Alaska,	Plank Ridge,
Buck Ridge,	Hammond,
Burnside,	Girard,
St. Nicholas,	Kentucky,
Colorado,	Greenback,
Turkey Run,	Bear Valley,
McMichael,	Big Mine Run.

No mixture of the different grades of coal will in any case be permitted; and each of the several classes of coal produced at the above-named collieries will be kept separate from the others. All sales will be made under the following designations:—

1. Hard white ash coal; 2. Free-burning white ash coal; 3. Schuylkill red ash coal; 4. Alaska red ash coal; 5. Shamokin white ash coal; 6. Shamokin red ash coal; 7. North Franklin coal; 8. Lorberry coal; 9. Lykens valley vein coal.

In order that all coal shall be shipped in good order, a most rigid system of inspection, both at the mines and at the shipping ports, will at all times be enforced. In every district of the coal region there will be appointed a number of competent persons skilled in the preparation of coal, as local inspectors, whose duty it will be to visit the several collieries daily to see that a proper force is at all times employed in removing slate, and to prevent, if possible, any coal being sent from the mines in bad order. In addition to these efforts at prevention, no means will be left untried at the shipping ports to cure the evils of careless preparation. At Schuylkill Haven, Port Clinton, and Port Richmond, all coal will be subjected to the personal examination of a skilled inspector before it is shipped, and if condemned by him, will be dumped in places provided for the purpose, and before being loaded into vessels will be thoroughly repicked and cleaned by hand, at the cost of the owner of the colliery that produced it. In entering into business as coal merchants, controling a production greater than that of any other seller, and embracing more than two-thirds of the coal to be shipped from Port Richmond, the Company are fully alive to the great importance of careful preparation, and will spare no expense to secure for their coals a reputation second to none in the country.

The company's ownership of ninety thousand acres of coal land in the first and second coal fields—the proximity of those regions to tide-water at Philadelphia—the advantages of the descending grades of the roads of the Philadelphia & Reading Railroad Company, and of the fleet of steam colliers being established by the latter Company, render it certain that the Philadelphia & Reading Coal and Iron Company will always supply a large proportion of the coal consumed upon the atlantic coast. In addition to these geographical and local advantages, the fact that they are the only one of the large mining companies whose lands produce all the known varieties of anthracite coal, from the hardest white ash to the softer coals of the Shamokin and Lorberry regions, so much in demand for domestic purposes, gives them an additional claim upon the favorable consideration of the coal-purchasing community.

The anthracite coal trade of this country will hereafter be controlled and prices established by those who actually represent the ownership of the coal itself, and the ruinous suspensions of mining and fluctations of prices will be avoided. It will be the great aim of the Company to induce a feeling of confidence on the part of their customers, so that retailers and manufacturers may take advantage of their capital to lay in their supply of coal whenever it is most convenient for them to do so, without any apprehension that the value of their stock will be impaired by any subsequent action of the Company.

On or about the 20th of each month throughout the season, circulars will be issued from the General Office of the Company, in Philadelphia, establishing prices for the succeeding month; and orders may be sent either to the Treasurer of the Company, in Philadelphia, or to the General Sales Agent, in New York. Propositions may be made to the Company at any time before the first day of April, 1873, for the purchase of a stated quantity of coal, to be taken in equal monthly proportions at current circular prices throughout the season; and if any such propositions is accepted by the Company, the purchaser may, on or before the first day of any month, have the privilege of declining to take the proportion due in such month, but such declination shall not give to him the right to take, in any succeeding month, any increased quantity in lieu of that so declined. FRANKLIN B. GOWEN,
PHILADELPHIA, February 5th, 1873. President.

Bituminous coal is still very scarce, and is quoted at $11.75. Freights are scarce and high.

The freshets which naturally accompany the breaking up of so hard a winter, have already begun to exhibit their effects. The Monongahela rose rapidly and carried off some boats, but the Lehigh and Schuylkill have so far been comparatively quiet.

Anthracite Coal Trade for 1871 and 1872.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending Feb. 8, 1873, compared with the week ending Feb. 10, 1872.

COMPANIES.	1872. WEEK.	1872. TOTAL.	1873. WEEK.	1873. TOTAL.
*Phila & Reading R.R†	24,041	453,715	52,089	566,001
*Schuylkill Canal	...	13,356	...	6,594
*Lehigh Valley R. R.	45,608	513,985	60,546	485,665
Lehigh & Sus. R. R.	11,654	133,314	42,218	196,111
Lehigh Canal	...	...	...	...
Scranton North	10,874	73,729	11,176	69,376
" South	34,219	225,149	34,610	188,008
Penn. Coal Co., rail	15,074	98,679	14,301	76,637
" " " canal	....	...	....	....
Del. & Hud. Canal Co.	...	...	...	...
" " East	7,479	62,588	3,836	32,568
" " West	7,010	41,360	9,031	40,873
" " South	6,041	41,280	6,240	35,151
Shamokin	7,530	34,807	7,835	50,269
Trevorton	....	.....	...	....
Lykens Valley Coal Co.	....	....	....	....
Wyoming North	....	.....	....	....
Wyoming South	....	.....	....	....
P. N. Y. C. & R. R. Co.	....	...	13,629	97,099
Williamstown Col'y	....	....	...	...
Big Lick Col	...	....	....	....
Total	169,530	1,692,962	255,491	1,824,852
1870	.....	.....	169,530	1,692,962
Increase	..	..	85,961	131,890
Decrease				

These figures are for the week and fiscal period commencing Nov. 30.

† Less coal transported for Company's use and Bituminous coal.

Bituminous Coal Trade, 1873 and 1873.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending Feb. 8, 1873, compared with week ending Feb 3, 1872.

COMPANIES.	1872. Week.	1872. Year.	1873. Week.	1873. Year.
C. & O. Canal	..	....	....	....
B. & O. R. R.	17,547	103,164	18,332	105,887
Penn. S. Line	....	.....	1,694	9,405
H. & B. T. R. R.	5,167	23,103	7,858	33,139
*Harrisburg & D	5,989	83,628	5,732	49,750
*L. V. R. R.	....	...	627	4,302
P. & N. Y. C. & R. Co.	4,688	53,586	228	40,384
Cumberl'd Branch Canal	....	....	....	....
" Railroad	....	....	3,303	9,819
Total	33,341	263,281	37,774	252,686
		252,686	33,341	
Decrease		12,595		
Increase			4,433	

Delaware Lackawanna & Western Rail Road Company.

Coal transported on the Delaware, Lackawanna, & Western Railroad for the week ending Saturday, Feb. 15, 1873.

	WEEK. Tons. Cw	YEAR. Tons. Cwt.
Shipped North	12,395 02	81,770 19
Shipped South	36,001 10	224,009 01
Total	48,396 12	305,780 00
For the Corresponding time last Year:		
Shipped North	12,049 14	85,978 05
Shipped South	33,542 00	258,690 12
Total	45,541 14	244,468 17
Increase	2,804 18	
Decrease	.....	38,688 17

Pennsylvania Coal Company.

Shipments of Pittston Coal for the week ending February 15, 1873.

	1873. WEEK.	1873. YEAR.	1872. WEEK.	1872. YEAR.
By Railway	15,474 03	92,110 15	17,633 03	116,302 10
" Canal	....	....	.. ..	
Total				
Decrease 1873	24,201 15			

Philadelphia & Reading Railroad and Branches.

COAL TONNAGE

For the Week ending Saturday, Feb. 15, 1873.

BY RAILROAD—ANTHRACITE.

PASSING OVER MAIN LINE AND LEH. VAL. BRANCH.

	Tons. Cwt.
From St. Clair	
" Port Carbon	3,175 04
" Pottsville	2,383 09
" Schuylkill Haven	2,[illegible]
" Pine Grove	[illegible]
" Tamaqua	745 13
" Harrisburg	3,676 09
" Dauphin	
Total	40,562 09

FOR SHIPMENT BY CANAL.

Passing Frackville Scales	
" Mill Creek "	
" Schuylkill Valley Scales	
" Mt. Carbon "	
" Cressona "	
" Pine Grove "	
" Tamaqua "	
Total	

SHIPPED WESTWARD VIA CATAWISSA AND WILLIAMSPORT BRANCH AND NORTHERN CENTRAL RAILROAD.

Via Catawissa & Williamsport Br.	491 15
" N. C. R. R. passing Locust Gap	1,367 17
" " " Shamokin	3,633 09
" " " Herndon	....
Total	5,493 41

SHIPPED WEST OR SOUTH FROM PINE GROVE.

Via Schuylkill & Susquehanna R. R.	727 02
" Lebanon & Pine Grove Branch	495 06
Total	1,222 08

CONSUMED ON LATERALS.

From Frackville Scales	4 03
" Mill Creek "	870 10
" Schuylkill Valley Scales	771 12
" Mt. Carbon "	1,402 01
" Cressona "	617 16
" Pine Grove "	28 12
" Tamaqua "	927 03
Total	4,916 03

LEHIGH AND WYOMING COAL.

Received via Silverbrook Junction, Sent East	47[illegible]
" " Cat. & Wpt. Br. Sent West	48 08
" " Rupert, Cat. & Wpt. Br.	
" " Allentown, L. Penn'a Br.	723 03
" " Alburtis, "	
" " Oreland, G. & N. Br.	1,183 09
" " Connecting R. R	
" " Willow Street R. R.	932 18
Total	7,019 07

BITUMINOUS.

From Harrisburg	5,299 01
" Connecting R. R., G. & N. Br.	
" Junction R. R.	
Total	5,299 01

COAL FOR COMPANY'S USE

Anthracite	7,418 11
Bituminous	374 01
Total	7,792 12

RECAPITULATION.

	Total for Week.	Corresp'g week last year.	Increase and Decrease.
Passing over Main Line and Leh. Val. Branch	40,562 09	59,176 01	d 18,691 12
For Shipment by Canal			
Shipped Westward via Northern Central R. R.	5 493 01	5,385 12	i 107 09
Shipped West or South from Pine Grove	1,222 08	1,369 08	d 147 00
Consumed on Laterals	4,516 03	2,760 10	i 1,755 13
Lehigh and Wyoming Coal	7,049 07	1,480 19	i 5,568 18
Total Anthracite paying freig't	58,861 08	70,170 02	d 11,308 14
Bituminous	5,299 01	5,640 03	d 341 07
Total of all kinds paying freig't	64,162 09	75,810 10	d 11,648 01
Coal for Company's use	7,792 12	2,782 08	i 5,010 04
Total Tonnage for Week	71,955 01	78,592 18	d 6,637 17
Previously this year	702,307 11	[illegible]	[illegible]
Total to date	774,262 12	738,066 01	i 36,196 11

SHIPPED BY CANAL.

From Schuylkill Haven			
" Port Clinton			
Total Tonnage per Week			
Previous y this year			
Totalto date	6.694 00	13,355 16	d 6,761 16

Report of Coal Transported over Lehigh Valley Railroad

Report of coal tonnage for the week ending Feb. 15, 1873, with totals to date, compared with same time last year.

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	TOTAL. Tons. Cwt.
Total Wyoming	15,2[illegible] 07	139,939 04
" Hazleton	32,206 05	2 3,764 11
" Upper Lehigh	60 18	854 14
" Beaver Meadow	14,533 04	120,744 16
" Mahanoy	9,699 19	64,082 01
" Mauch Chunk	168 02	616 14
Total	72,679 15	538,999 02
Same time last year	54,700 11	638,228 13
Increase	17,8[illegible] 04	
Decrease		9,379 11
Forwarded East from Mauch Chunk by rail	60,650 03	326,315 05
Same time last year	45,290 12	359,265 05
Increase	15,359 17	
Decrease		32,950 00

DISTRIBUTED AS FOLLOWS.

Forwarded East from Mauch Chunk by rail	59,636 03	315,145 15
do East for use L. V. R. R.	1,014 01	11,169 10
Delivered at and above Mauch Chunk for use of L. V. R. R.	1,666 09	14,313 09
To P. & N. Y. R. R.	8,149 17	88,190 08
To N. C. R. R., at Mount Carmel		1,788 19
To D. H. & W. R. R.	1,192 00	8,617 15
To L. & S. R. R. at Packerton for rail	218 11	2,130 04
Delivered at M'h Chunk	31 09	1,014 04
Delivered on line of road above Mauch Chunk	837 00	3,843 19
To L. S. & R. R., at Penn Hav., for railroad		
Do. for canal		
To Lehigh Canal Mauch Chunk		
To Catawissa Railroad		35 00
Total	72,679 15	538,999 02

Statement of Coal Transported over Cumberland and Pennsylvania Railroad

During the week ending Saturday Feb. 15, and during the year 1873, compared with the corresponding period of 1872.

WEEK.

	C. & O. C'l Tons. Cwt.	B. & O. R. R. Tons. Cwt.	Pa. S. Line Tons. Cwt.	Total. Tons. Cwt.
1872	—	22 325 07	1,530 12	23,855 19
1871	—	19,433 17	....	19,433 17
Increase	....	2,891 10	1,530 12	4,422 02
Decrease	—	.....	....	

YEAR.

1872	—	128,212 16	10,936 17	139,148 13
1871	—	122,597 16	....	122,597 16
Increase	....	5,615 00	10,936 17	16,550 17
Decrease	—	....	....	....

Cumberland Branch R. R.

WEEK.

	To C. & O. Canal. Tons. Cwt.	To B. & O. R. R. Co Tons. Cwt.	Total. Tons. Cwt.
1873	—	2,876 15	2,876 15
1872	—		
Increase	—	2,876 15	2,876 15
Decrease	.....	.....	.....

YEAR.

1873		12,696 01	12,696 01
1872			
Increase		12,696 01	12,696 01
Decrease			

Penn. and N. Y. R. R.—Coxton, Pa.

Coal tonnage for week ending February 15, 1872.

	Week. Tons. Cwt.	Total. Tons. Cwt.
Anthracite received:		
From Lehigh Valley R. R.	8,149 17	68,190 06
" Lack. & B. R. R.	....	5,247 11
" Pleasant Valley R. R.	3,083 18	28,898 04
" Sul. & Erie R. R.	1,084 16	7,586 12
Total	12,318 11	109,917 13
Same time last year	9,112 00	97,760 04
Increase	3,206 11	$ 12,157 09
Decrease		
Distributed:		
To Lehigh Valley R. R.	846 17	8,718 15
To Lack. & B. R. R.	....	286 09
To S. Central R. R.	3,180 04	23,532 08
To Ithaca & A. R. R.	1,062 09	14,004 07
To Erie R. W. Pockets for shipm't.	4,982 13	32,570 08
To individuals on line of road	627 02	10,536 10
To points at & above Coxton for use of Co.	157 12	5,579 06
To points between Waverley and Elmira	1,461 13	14,740 10
Total	12,318 11	109,917 13
Bituminous received from BARCLAY R. R.		
Shipped north from Towanda	....	40,155 17
Shipped south from Towanda	....	228 07
Northern Central R. R.	....	
Total	....	40,384 04
Same time last year	5,131 06	58,517 03
Increase		
Decrease	5,131 06	18,132 19
Distributed:		
To Erie Railway	....	32,362 03
To So. Central R. R.	....	7,699 09
To Ithaca Valley R. R.	....	71 08
Lehigh Valley R. R.	....	142 13
To individuals on line of Railroad.	....	66 19
To points on line of road for use of Company		41 12
Total	....	40,384 04
Grand totals transported		
Anthracite	12,318 11	109,917 13
Bituminous	.....	40,384 04
Total	12 318 11	150,301 17
Same time last year	14,243 00	156,277 07
Increase	1,924 15	5,975 10
Decrease		

Report of Coal Transported over Central R.R. of N. J. (Lehigh and Susq. Div.)

Week ending February 15—Compared with same time last year.

WERE SHIPPED FROM	WEEK 1873, tons ct.	WEEK 1872. tons ct.	YEAR 1873 tons cwt.	YEAR 1872, tons. cwt.
Wyoming Region	26527 05	10092 07	203280 08	124641 06
Upper Lehigh Region	4 13 06	3297 10	25146 16	22232 13
Beaver Meadow Region	5042 17		23 45 04	5309 03
Hazleton Region	364 18	370 17	2107 09	1951 16
Mauch Chunk Region	9659 14	5573 06	44363 01	24973 04
Tresckow Region				
Mahanoy Region				
Totals	36258 00	19334 06	298 43 01	184110 02
Increase	16923 14		114032 19	
Decrease				
DISTRIBUTION.				
Forwarded East of Mch Chunk by Rail	45544 05	15087 01	241655 03	1[illegible] 04
Forwarded East of Mch Chunk by Canal				
Delivered at and above Mauch Chunk	1184 09	671 12	12788 03	7[illegible] 17
" T. R. M. at Packer'n	1075 04	434 12	6466 11	1[illegible] 17
" ivered to L. & B. R. R.	1869 15		11825 07	
R at Plymouth Bridge	5194 07	3191 01	25436 16	26182 04
Totals				
Of the above there was transported on acc'nt of L. C. & N. Co.	16715 16	5573 06	83393 16	29291 18
W.-B. C. & L. Co.	19218 14	6264 07	[illegible]110738 16	91241 01
Totals	35934 10	11837 13	[illegible]194132 12	120533 19
Increase	24096 17		73598 13	
Decrease				

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, February 15, 1873.

	WEEK.	SEASON.
By Delaware and Hudson Canal	....	.....
By Railroad, East	5,773	38,341
" West	17,449	52 321
" South	6,451	41,602
Total 1872	29,673	132,264
Corresponding time in 1871:		
By Delaware and Hudson Canal	....	....
By Railroad, East	7,728	70,317
" West	8,775	50,134
" South	6 597	47,627
Total	23,100	168,278
Decrease	36,014	

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, February 15, 1873.

	WEEK.	SEASON
North	54,725 09	282.098 00
South	6,450 17	41,602 03
Total 1873	61,176 06	323,700 03
Correspond.ng time in 1872:		
North	46,819 18	319,876 16
South	6,597 01	44,053 19
Total	53,416 19	363,930 15
Increase North		
Decrease No th		
Increase South		
Decrease South		
Increase	7,759 07	
Decrease		40,230 12

Lehigh Coal and Navigation Company.

Report of Coal transported over the Lehigh and Susquehanna Div of Central Railroad of New Jersey for the week ending Feb. 8, 1873, and for the year 1873.

	WEEK.	YEAR.
Forwarded East of M'ch Chunk by Rail	42,218 03	196,110 18
Delivered at and above do.,	2,096 15	10,884 13
Forwarded East of do., by Canal	.....	
	44 314 18	206,995 11
Corresponding period last year—		
Forwarded East of M. Chunk by Rail	11,653 16	133,314 03
Delivered at and above do.,	286 13	7,098 05
Forwarded East of do., by Canal	.....	
	11,940 09	140,412 08
Increase on Railroad	32,374 09	66,583 03
Decrease " "	.....	
Increase on Canal	.....	
Decrease " "	.....	
Of the above there was transported on account of—		
Lehigh Coal Nav. Co	14,274 17	66 678 00
Wilkesbarre Coal & Iron Co	21.218 02	91.520 02
	35,492 19	158,198 02
Corresponding period last year—		
Lehigh Coal & Nav. Co	2.145 09	23,718 12
Wilkesbarre Coal & Iron Co	6,058 09	84,977 14
	8,203 18	108,696 06
Increase	27,289 01	
Decrease		49,501 16

Northern Central Railway, Shamokin Division.

Below is the return of Coal sent over the Shamokin Division of the N. C. R. W., for the 7 days ending January 31, 1873.

	Tons. Cwt.
East	207 02
West	7,471 01
	7,678 03
Same time last year	1,333 18
Increase	6,344 05
Decrease	.....
Total amount shipped to date	42 434 16
Same time last year	23,275 04
Increase	19,158 12
Decrease	

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

	AT NEW YORK. February 21. R. A.	W. A.	AT PHILADELPHIA. February 21. R. A.	W. A.
SCHUYLKILL.				
Lump	$— —	$— —	— —	
Steamer	— —	— —	— —	— —
Broken	— —	— —	— —	
Egg	— —	— —	— —	— —
Stove	— —	— —	— —	— —
Chestnut	— —	— —	— —	
Pea	— —	— —	— —	— —
LEHIGH.				
Freight to New York 50 cents.			— —	— —
Lump, (on board)	— —	5 00	— —	— —
Broken	— —	4 75	— —	— —
Egg	— —	4 75	— —	— —
Stove	— —	5 10	— —	— —
Chestnut	— —	4 15	— —	— —
Pea	— —	— —	— —	— —
SPECIAL COALS.				
Honey Brook, Le'h W.A.	4 15@5 10		— —	— —
Spring Mountain " "	—@—		— —	— —
Sugar Creek	—@—		— —	— —
Sugar Loaf	—@—		— —	— —
Old Comps's	4 15@5 10		— —	— —
Room Run	4 15@5 10		— —	— —
McNeal	— —		— —	— —
Girardville	— —		5 10@4 00	— —
Hill & Harris	— —		— —	— —
Shamokin	— —		— —	— —
Lykens Valley	— —		— —	— —
Broad Top	— —		3 25@4 25	— —
McMichael	— —		— —	— —
Henry Clay	— —		— —	— —

Company Coals.

February, 1873.

	L.	Str.	Ora.	Rg.	Sto.	Chest
*Scranton at K. Port	4 00	3 95	4 10	4 40	5 00	2 90
Pittston at Weehawken	4 40	4 40	4 40	4 40	4 80	4 40
*Lackawana at Weehawken	4 20	4 30	4 40	4 65	5 10	4 30
Wilk'b're at Hoboken	4 25	4 35	4 45	4 70	5 15	4 35
Old Co. Lehigh at Pt. John's	5 25	—	4 85	4 90	5 15	4 15
Lehigh at Eliz. Port	5 00	—	4 75	4 75	5 10	4 15

For freights to different points see "Freights."
*To contractors only.

Prices at Baltimore—February, 1873.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$5 35@5 60
Pittston and Plymouth, do	5 25@5 50
Shamokin Red or White Ash, do	5 50@5 75
Lykens Valley Red Ash, do	6 25@6 50
Zerba Valley	
Treverton	
By retail, all kinds per ton of 2,240 lbs	7 25@7 50
George's Creek and Cumberland f. o. b. at Locust Point for cargoes	@4 75
Fairmont and Clarksburg gas f. o. b. at L. Point	6 00
BITUMINOUS COALS.	
Kittaning Coal Co.'s Phœnix Vein, f. o. b. at Phila	$
Lemon " " "	
Cumberland Vein Coal	
Consolidation Coal Co.'s on board at Baltimore	
Maryland Coal Co. "	

Prices at Georgetown, D.C., and Alexandria, Va.

February, 1873.

George's Creek and Cumberland f. o. b. for shipping	$....@....
No coal before spring.	nominally.

Prices at Havre de Grace, Md.

February, 1873.

Wilkesbarre and other White Ash for Cargoes	$ @4 75
Lykens Valley	@5 75
Shamokin Red or White Ash	5 00

Bituminous Coals (Cumberland).

Georgetown, F.o.b.	$
Baltimore "	
New York "	

Prices of Foreign Coals,

February, 1873.

Duty 75 c. per ton.

Corrected weekly by ALFRED FARMELE, No. 32 Pine street, N. Y.

Liverpool Gas Caking	Nominal.
" " Cannel	15 00@16 50
" House	22 00@23 00
" Orrel	17 00@18 00
Per ton 2,240 lbs., ex-ship.	
PRICES FROM YARD.	
Liverpool House Orrel, screened	$20 00@22 00
"Cannel, "	23 00@25 00
Per ton 2,000 lbs. delivered.	

Prices of Gas Coals.

February, 1873.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr., 41-43 Pine st., N. Y

	Coarse	Slack.
Block House	$2 00	$1 00
Gowrie	1 75	— 80

Corrected by Bird, Perkins & Job, 27 South street.

	Coarse.	Culm of Coal,
Picton	$2 25	1 25
Sydney	2 25	— 80
Lingan	1 75	— 80
Caledonia	1 75	— 80

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty on all slack coal or Culm: 40c per ton of 28 bushels, 80 pounds to the bushel. On all bituminous coal or shale: 75 cents per ton or 28 bushels.

AMERICAN.	Nominal quo. Currency.
Westmoreland	$7 10 @— —
Fairmount Gas Coal Co. of N. Y	7 00 @— —
Despard Coal Co.	7 00 @— —
Penn	7 10 @— —
Newburg Orrel Gas	— — @— —
West Fairmount Gas Coal	7 00 @— —
Redbank Cannel, Penn	— — @— —
AT PHILADELPHIA.	
Westmoreland	7 00 @— —

Rates of Transportation to Tide Water.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Schuylkill Haven Lump and St., net, $1 60; Br., Egg and Ch., $1 65; Stove, $1.75 Shipping at Pt. R., 22c., for use at Phil., $2 18 from Pt. Carbon.	
MAUCH CHUNK TO ELIZABETHPORT.	
L. V. Railroad from Mauch Chunk to Phillipsburgh	$0 72
C. R. R., N. J., Phillipsburgh to Elizabethport	1 06
Shipping expenses at Elizabethport	25
Wharfage	10
Total	$2 23
MAUCH CHUNK TO PORT JOHNSTON.	
L. V. R.R., or L. & S. R. R. from M. C. to Phillisb'g	$0 72
C. R. R., of N. J., Phillipsburgh to Pt. Johnson	1 06
Shipping expenses	25
Wharfage	10
Total	$2 23
TO HOBOKEN	
L. V. R. R., Mauch Chunk to Phillipsburgh	72
Morris & Essex R. R. Phillipsburgh to Hoboken	1 06
Shipping expenses	25
Wharfage	10
Total	$2 23
TO SOUTH AMBOY.	
L. V. R. R.	72
B. & D. R. R. / Cam. & Am. R. R.	1 06
Shipping Expenses	25
Total	$2 23
PENN HAVEN TO ELIZABETHPORT.	
L. V. R R. Penn Haven to Phillipsburgh	0 84
C. RR. of N. J. Phillipsburgh to Elizabethport	1 06
Shipping expenses	15
Wharfage	20
Total	$2 25

Foreign and Provincial Freight

February, 1873.

Foreign.	
Newcastle and Ports on Tyne, per keel of 21 l-	
Liverpool, 5 per cent primage	
TO NEW YORK.	
Provincial	
Sydney	$3 03
Lingan	3 50
Cow Bay	3 75
Port Caledonia	3 10
Little Glace Bay	3 00
TO BOSTON.	
Sydney	3 00
Lingan	3 00
Cow Bay	3 00
Port Caledonia	3 00
Little Glace Bay	2 90

Freights.—February, 1873.

TO EASTERN PORTS.	Cumberland. From Georgetown.	Cumberland. From Baltimore	Anthracite. From Phila'd'a.	Anthracite. From Elm. Port, Port Johnston, and Hoboken.	Anthracite. From Newburgh.	Anthracite. From Rondout.
Amesbury						
Bangor		4 75				
Bath						
Boston	3 10	4 00	3 00	3 00		
Bridgeport	2 75	3 75	1 00	1 00		
Bristol			2 00	2 00		
Cohasset Narrows	2 25		1 25			
Derby			ice	ice		
Dighton	2 85		ice			
East Cambridge			3 10	3 00		
Fall River	2 75	3 90	2 00	2 00		
Hackensack			ice			
Hartford			ice	ice		
Hoboken	2 10		50	50		
Jersey City	2 10		50	50		
Lynn			1 35			
Middletown			ice	ice		
Mystic			ice			
New Bedford	3 00		2 00	2 00		
Newburyport	3 10	4 75	3 25	3 20		
New Haven	2 75	3 75	1 00	1 00		
New London	2 75	3 75	1 45	1 45		
Newport	2 30		2 00	2 00		
New York	2 25	3 50	50	50		
Norwalk	2 50		1 00	1 00		
Norwich			1 65	1 60		
Pawtucket			ice	ice		
Portland	3 25	4 25	2 50	2 00		
Portsmouth, N. H		4 75	3 10	2 15		
Providence	2 75	3 98	2 00	2 00		
Rockport						
Saco						
Sag Harbor			1 45	1 40		
Salem	2 70	4 50	3 00	3 00		
Stamford			1 00	1 00		
Stonington			1 50	1 50		
Taunton			ice	ice		
Warren			2 00	2 00		
TO RIVER PORTS						
Albany						
Catskill						
Cockzackie						
Coeyman's						
Cold Spring	2 30					
Fishkill						
Haverstraw						
Hudson	3 25					
New York						
Nyack	2 25					
Poughkeepsie	2 50					
Rhinebeck						
Rondout						
Saugerties						
Sing Sing						
Stuyvesant						
Tarrytown						
Troy	3 00					
West Point						
Yonkers						

St. Thomas	$5 00	Gold.
Martinique	5 00	
Demerara	6 00½	
New Orleans	6 10	
Mobile	6 00½	

MARKET REVIEW.

NEW YORK, Feb. 20, 1873.

IRON.—The market for Scotch Pig shows no change from previous reports. Advices from abroad quote full previous prices, while the business here is confined entirely to small jobbing parcels to meet the immediate wants of customers. The present high prices have the tendency to restrict manufacturing operations, and we understand that most consumers are at present working short time. The only sale we hear of is 50 tons of English, reported at a price above our quotation. While holders are asking full rates, any lot forced on the market would perhaps hardly bring our figures. American Pig is firm at $50 for No. 1, $47a$48 for No. 2, and $42a$44 for Gray Forge; sales 100 tons No. 1, Thomas at $50; 450 do. No. 1 Allentown, same price; 200 do. No. 2 Poughkeepsie, 400 do. White Mottled, and 1000 do. brands not named, on terms not made public. A meeting of the manufactures of American Pig is to take place at the St. Nicholas Hotel to-day, at which it will be proposed to advance the price of No. 1 to $55. American Rails are very quiet at $80 currency at the works in Pennsylvania. New English are dull and selling below cost of importation; $70 gold is about the outside price. Old English have been active and sales have been made at very full figures, on the spot and to arrive, comprising 300 tons D. H. from store at $59,75, four months interest added, and 600 do. to arrive, on terms not made public. Scrap is firmly held at about $57a60 from yard; a lot of 120 tons sold from ship at $52.50 currency, and sales are reported of several hundred tons to arrive at a neighboring port at $53, but we could not confirm them. Refined Bar is dull but firm at our quotations.

AMERICAN RAILROAD IRON.—The trouble in the English Coal and Iron trades has been a golden opportunity for American Iron interests. The production of American Railroad Iron in 1872, reached the unprecedent amount of 975,000 tons, an increase of 200,000 tons in one year. As compared with 1864 the production of 1872 shows an increase of 191 per cent., the amount in the former year having been only 335,000 tons. The importation of Rails from Great Britain in 1872 amounted by the Board of Trade returns to 472,700 tons—which amounts to 529,491 tons of 2000 pounds. In 1871 the proportion of English Railroad Iron to the entire consumption was more than forty-three per cent., but it is reduced for 1872 to thirty-five per cent., the supply from Great Britain having actually diminished during the year, while the aggregate consumption has increased by more than 150,000 tons. The prospects of the Trade were never better than they are now. The foreign markets are in a most unsettled condition, our capacity of production is increasing, and the demand for consumption goes on at an accelerating ratio. A year or two of the same experience and we shall be independent of the English Iron market, and may even begin to compete with it for the foreign trade.

LEAD.—Ordinary Foreign Pig is generally held on the spot at 6¼a6¾ cents gold; 200 tons Spanish sold, to arrive, at 6¾ cents gold. Bar is steady and firm at 9¼ cents, Sheet and Pipe 10½, and Tin-lined Pipe 16½, less 10 per cent to the Trade.

COPPER.—New Sheathing is firm at 43 cents, and Bolts and Braziers 45, Bronze and Yellow Metal Sheathing 27, and Y. M. Bolts 32, net cash. Ingot is quiet, the close money market restricting the demand; holders of Lake generally ask 35 cents, but where parcels are forced on the market. 34¼a34½ is as much as can be obtained; the sales are 50,000 lb. Lake at 34½ cents, prompt cash; 60,000 lb. do., part 35; and 50 tons B. S. English, 30a30½, 30 days. At the close, Lake may be quoted 35 cents, cash and all the month, and 35½ for March and April; English, on the spot, 30¼a30½, 30 days.

TIN.—After the excitement and activity of last week in Pig, the market has become more calm, and the extreme figures asked at our last writing have not been obtained; sales have been made of 300 slabs Straits at 31¾ cents; 600 do. 32a32¼; 10 tons English, 31¾a32; and 10 do. at a private price. At the close there was a rather more confident feeling, the quotations being for Banca 37½ cents, Straits 32½, and English 31¾a32, all gold. We notice the shipment from Boston to Liverpool of 1638 slabs Tin. Plates have been less active, but prices are well sustained; the sales are 1000 bxs. Charcoal Tin at $11,50 for I. C., generally held at $11,75; 750 do. Coke Tin, 10,25; and 800 do. Charcoal Terne, $10.50 all gold.

REGULUS ANTIMONY.—May be quoted 13¾ cents gold, which is lower.

STEEL.—There is no change, the market being firm and scantily supplied.

SPELTER.—Remains quiet but firm; 25 tons Silesian sold at 7¾ cents gold, and 25 tons on private terms. Domestic is held at $9,50 currency.

ZINC.—Sheet is steady and firm at our quotations—100 casks Mosselman sold from agents' hands at 9½ cents, less 4 per cent. gold. Manganese black oxide 3 cents, do. per oxide 5½ cents.

Edward Samuel under date of Philadelphia Feb. 19, 1873, quotes as follows

American No. 1, foundry, at Furnace, $47a49; No. 2, $43a45; No. 3, Forge, $39a40; No. 4, White and Mottled, $33a36; Scotch Pig, Cargo Lots, for shipment, $56a58; Old Rails, DHs, for shipment here, $52a53, gold; do. on the spot and for arrival, $50a51; No. 1, Wrought Scrap, ex ship, $49a50; do. for shipment here from abroad $49a$50; American Refined Bar, Mill price, 4·2a4·3 cents, Common $37,50a90; Rails, at Mill, $82a84; English Rails, ex ship, N. Y., $72½a74, gold.

METALS.

NEW YORK, February 20, 1873.

IRON.—Duty: Bars, 1 to 1½ cents ₰ lb; Railroad, 70 cents ₰100 lbs.; Boiler and Plate, 1½ cents ₰ lb; Sheet, Band, Hoop, and Scroll, 1¼ to 1¾ cents ₰ lb; Pig, $7₰ ton; Polished Sheet, 2 cts. ₰ lb; Galvanized 2½; Scrap Cast, $6; Scrap Wrought, $8 per ton. All less 10 per cent. No Bar Iron to pay a less duty than 35 per cent. ad val.

	Store Prices.
Pig, Scotch—Coltness ₰ ton	$1 50@— —
Gartsherrie	59 00@60 00
Glengarnock	57 00@58 00
Eglinton	56 00@56 00
Pig, American, No. 1	— —@50 00
Pig, American, No. 2	47 00@48 00
Pig, American, Forge	42 00@44 00
Bar Refined, English and American	— —@110 00
Bar Swedes, assorted sizes gold	120 00@130 00
	Store Prices, Cash.
Bar, Swedes, 1¾ to 5 x ⅜ & ¾ 2 sq. & 6 to 12 x ⅜ & ¼	145 00@155 00
Bar, Refined, ¾ to 2 in. rd. & sq. 1 to 6 in. x ⅜ to 1 in.	105 00@— —
Bar, Refined, 1¼ to 6 by ¼	— —@110 00
Bar, Refined, 2⅝ to 2¾ round 1 & 1¼ by ¼ & 5:16	112 50@— —
Large Rounds	112 50@125 00
Scroll	120 00@130 00
Ovals and half-round	130 00@150 00
Sand	— —@122 50
Horse Shoe	117 50@127 50
Rods, ⅜ to 3-16inch	110 00@122 50
Hoop	130 00@173 50
Railroad	66 9
Sheet, Russia, as to assortment (gold)	16 @ 16½
Sheet, Singles, D. and T. Common	—6¾@— 7½
Sheet, D. and T. Charcoal	—7¾@— 8½
Sheet, Galv'd, list 5 per cent, discount	—@— —
Rails, English (gold), ₰ ton	69 00@ 70 00
Rails, American, at Works in Pennsylvania, currency	60 00@ 00 00

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 6 cents ₰ lb; Manufactured, 45 per cent. ad val.

	All Cash.
Copper, New Sheathing, ₰ lb	—@— 43
Copper Bolts	—@— 46
Copper Braziers, 16oz. and over	—@— 45
Copper Nails	—@— 45
Copper, Old Sheathing, &c. mixed lots	28 @— 30
Copper, Old, for chemical purposes, 14@16 oz.	—@— —
Copper, American Ingot	34½@— 35
Copper English Pig	30¾@— 30¾
Yellow Metal, New Sheathing & Bronze	27 @— 29
Yellow Metal Bolts	—@— 32
Yellow Metal Nails	27 @— 30

LEAD.—Duty: Pig, $2 ₰ 100 lbs.; old Lead, 1¼ cents ₰ lb Pipe and Sheet, 2¾ cents ₰ lb.

Galena, ₰ 100 lbs	$— —	@— —
Spanish (gold)	6 37½	@6 50
German, do.	6 37½	@6 50
English do.	6 50	@7 00
Bar (net)	9 25	@— —
Pipe (net)	— —	@10 50
Sheet	— —	@10 50

STEEL.—Duty: Bars and ingots, valued at 7 cents ₰ lb or under, 2¼ cents; over 7 cents and not above 11, 3 cents ₰ lb; over 11 cents, 3½ cents ₰ lb, and 10 ₰ cent ad val. Store prices.

English Cast (2d and 1st quality) ₰ lb	— 13	@— 22
English Spring (2d and 1st quality)	— 9½	@— 10½
English Blister (2d and 1st quality)	— 11½	@— 16
English Machinery	— 11½	@— 14
English German (2d an 1st quality)	— 11½	@— 12
American Blister "Black Diamond"	— —	@— 11½
American, Cast, Tool do.	— —	@— 17
American, Spring, do.	— —	@— 11
American Machinery do.	— —	@— 11½
American German, do	— 9	@— —

TIN.—Duty: Pig, Bars, and Blocks, 15 ₰ cent. ad val.; Plate and Sheets and Terne Plates, 25 ₰ cent.; Roofing ₰. ad val.

	Gold ₰ lb.
Banca	— @27½
Straits	32½@32¾
English	34½@36

PLATES.

Fair to Good Brands.	Gold.	Currency.
I. C. Charcoal, ₰ box	$— — @11 75	$13 75 @14 00
I. C. Coke	10 25 @10 75	12 00 @12 50
Coke Terne	9 00 @ 9 75	10 50 @11 50
Charcoal Terne	10 25 @10 50	12 00 @12 37½

SPELTER.—Duty: In Pigs, Bars & Plates, $1.50 ₰ 100 lbs.

Plates, Foreign (gold) p. 100 lb,	7 15	@ 7 37½
Plates, Domestic p. lb.	8¾	@— 10¾

ZINC.—Duty: Pig or Block, $1.50 per 100 lb.; Sheet 2½c. per lb.—10½@11 ₰ Sheet per lb.

San Francisco Stock Market.

BY TELEGRAPH.

NEW YORK, Feb. 20, 1873.

We have advices from the San Francisco Stock Board dated the 13th and 18th; the market is dull and quotations remain almost the same from day to day, the only exception to the continued downward tendency of the list is a slight advance in Meadow Valley. A recent telegram from Central City, Colorado, states that four large silver bricks, each weighing 115 pounds, were brought to this city yesterday from the Cariban Mine, the total coin value of which is $55,924 and is the result of four days run on Cariban ore. This mine is yielding about $2000 per day, and is regarded as second only to the Comstock lode in Nevada.

The Levitt gold mine at this city yielded $21,000 gold bullion last month. The Comstock lode will soon be shorn of its laurels if this state of things continues to increase.

	Feb. 13.	Feb. 18.
Savage	73	73
Crown Point	101	101
Yellow Jacket	78	78
Kentuck, "New Issue"	11¾	10
Ubollar Potosi	62	60
Gould & Curry "New Issue"	15	14¾
Belcher "New Issue"	60	58
Imperial	7¾	6¾
Raymond & Ely	23	24
Meadow Valley	14¼	14¾

ANNUAL REPORT OF THE LEBANON MINING CO. of New York

This is to certify that the capital stock of the Lebanon Mining Company of New York consists of ten thousand shares, at the nominal par value of one hundred dollars each, which has all been issued for the purchase of Mining Property, and that the debts of the company do not exceed the sum of sixty thousand dollars.

Dated at New York, this 10th day of January, 1873.

FELIX STOIBER, President.

THEODORE C. POHLE, Secretary.

FELIX STOIBER,
THEO. C. POHLE,
THOS. S. OLLIVE,
LOUIS FRANEK,
Majority of Trustees.

City and County of New York, ss.:

On this, the 13th day of January, A. D., 1873, personally appeared before me, Theodore C. Pohle, Secretary of the Lebanon Mining Company of New York, to me known to be the same individual described herein, who acknowledged to me that the facts stated in the above report are true, to the best of his knowledge and belief.

WM. HIBBARD, Notary Public, 43,
City and County of New York.

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AND PUMPS FOR ALL PURPOSES.

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J. D. WEST & CO.,

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THE TANITE COMPANY,

Manufacturers of Solid Emery Wheels, from one inch to three feet diameter. Emery Grinders for Stove Manufacturers, Foundries, Machine and Railroad Shops, Planing Mills and Saw Mills. Emery Wheels and Saw Gumming Machines for sharpening and gumming Gang, Mulay and Circular Saws.

A judicious use of Tanite Emery Wheels and Grinding or Gumming Machines, will more than repay the cost in this year's work! Write for Circulars and Photographs to

THE TANITE CO., Stroudsburg, Monroe Co., Pa.

Feb. 25 6m

Fulminates Exploded by Sound.

One of the most delicate explosive compounds known is the iodide of nitrogen, made by dissolving iodine, in fine powder, in strong liquor ammonia. If two small pieces of paper, to each of which three hundredths of a gramme of this compound adheres, are placed at the opposite ends of a glass tube eight feet long and half an inch in diameter, and the fulminate on one of the papers is exploded, the other immediately explodes likewise. This is not due to concussion communicated by the tube, for the same thing occurs when the tube is broken in the middle and again united by a strip of paper. It does not occur in consequence of any movement of air through the tube, because a little pendulum placed within it is not more disturbed by the explosion than by a slight breath blown through the tube by the mouth. The secondary explosion takes place in consequence of the sound waves arising from the first explosion. Any sharp sounds will detonate this delicate powder. The high notes of a violin, for instance, or of a high-pitched gong, suffice to produce the explosion; but the bass notes are ineffective. A striking experiment which may be performed with this substance, and which illustrates most effectively the laws of sound, is to place two concave parabolic mirrors eight or nine feet apart, with a small quantity of nitro-glycerine in the focus of one mirror, iodide of nitrogen in the focus of the other, and a second quantity of iodide in the center of the space between the mirrors. The explosion of the nitro-glycerine will explode the iodide in the focus of the opposite mirror, while that in the center remains unaffected. This effect might be attributed to the heat produced by the explosion of the nitro-glycerine; but if the first mirror is smoked and 10 grammes of gunpowder exploded in its focus neither mass of iodide is affected. This quantity of powder gives an amount of heat ten times as great as that from three hundredths of a gramme of nitro-glycerine, while the force of explosion of the two is the same. The absorption of heat by the darkened mirror prevents any action from that source. Why it is that 0·03 grammes of nitro-glycerine produce an explosion which 10 grammes of powder, having equal power, fail to accomplish, is not yet explained.

Few people understand how delicate some explosive compounds are. A sharp word spoken, the rapid passage of a person through the room, the sudden opening of a door, can produce the explosion of some of these more delicate compounds; and facts of this kind should warn us against the use of the "oversensitive" exploders made by some nitro-glycerine manufacturers, who desire to make the cost of using that exploding agent as cheap as possible. Such exploders may be detonated by a sharp word, by the ringing of the hammer on the drill, and by similar unavoidable causes. They are sufficiently dangerous at the best; and now that this new element of danger has been developed, there should be no hesitation whatever in rejecting the use of nitro-glycerine in cases where the work to be done is not important enough to warrant the employment of safe means of firing the charges

The influence of sounds on the safety of the miner has lately received attention from another quarter. Dr. GALLOWAY made some experiments in the old laboratories of the Royal Institution in London to ascertain the conditions under which explosions take place, even when the safety lamps are properly used. It has been noticed that in these cases they most frequently occur after the firing of a blasting shot in the neighborhood; and it is certain that the penetration of the fire-damp through the gauze of the lamp is the great determining cause of the explosion in such cases. It has been ascertained that this penetration is not due to the sudden flow of gas from one part of the mine to the other. Experiments have therefore been instituted to determine whether the transmission of the sound-wave, or wave of compression, may not have been the means of producing the mischief. In one of these a long tin tube is so arranged that one half of it contains the inflammable current circulating round a burning safety lamp, which is placed at the extremity of the tube. In the center of this tube is a loose diaphragm. On firing a pistol at the open end of the tube the sound-wave is found to travel along it, and to carry through the meshes of the gauze the combustible gas, and explosion follows.

The experiments proved that ignition of mine gas from a safety lamp was, like the detonation of the mercury iodide, not due to concussion of the air produced by the exciting explosion, but by the sound-waves acting, in the one case on the flame, and in the the other case on the very sensitive fulminate.

The Elements of Success in the Bessemer Process.

Translated from *Die Metallurgie* of Dr. C. STÖLZEL.

(Continued from Page 104.)

THE spiegeleisen, as already mentioned, plays an important part in the Bessemer process, inasmuch as it serves to reconvert the decarbonized iron into steel, and to increase the density of the castings.

2. With regard to the blast, it should be present in sufficient quantity, and ought to pass through the mass of liquid iron sufficiently divided, and under strong pressure, so that every portion of the charge may come in contact with the oxygen of the air. Concerning this point, it is to be taken into consideration that not only the pressure of the liquid iron column must be overcome, but also a considerable friction, hence, only those blowing engines are applicable, which combine great power with high velocity. To this end, double-acting engines with horizontal cylinders and slide-valves, or valves of a round form, are very suitable. LEYSER & STIELER, in Vienna, construct apparatus especially adapted to the Bessemer process; the same have circular caoutchouc valves with metallic packing, the rings of which are pressed by the blast against the sides of the cylinder.

According to the experiments of GRÜLL, at Edsken, there were used in the Swedish method for every hundred pounds of pig 395½ cubic feet of air of atmospheric density, which would contain seven pounds of oxygen. This amount is sufficient to oxydise 3 lbs. carbon, 0.5 lbs. silicon, an 8.4 lbs. of iron to oxide of carbon, silicic acid and protoxide of iron. This corresponds to a waste of nearly 12 per cent., which, in fact, takes place. By following the English method, more blast is required, especially on account of the larger waste of iron. According to WEDDING, Messrs. BROWN & Co., in Sheffield, use for every 100 lbs. of pig 495 cubic feet of air, which contain 8.9 lbs. of oxygen. Supposing that of 100 lbs. pig, there are oxydised 3.5 lbs. carbon, 0.5 lbs. silicon, and 10 lbs. iron in the way indicated, we obtain a waste of 14 per cent., for which 8.08 lbs. of oxygen are theoretically required. The charge is 66 cwt., and the duration of the process 17 minutes. In Neuberg, they use for every 100 lbs. pig 660 cubic feet air, equal to 11 lbs. oxygen. The waste is 17 per cent. Since the quantity of the air varies according to the quantity and quality of the pig iron used, as well as to the duration of the operation, and as the loss of blast occurring can only be ascertained approximatively, the numbers given above can only claim an approximate correctness; but it may be inferred, with some degree of certainty, that the *whole* of the oxygen is being used, and that it just suffices to oxydise the carbon and iron to oxide of carbon and protoxide of iron. When the quantity of air conveyed to the converter is diminished, a bad working will be the result, and it is therefore comprehensible why a defect in the blowing contrivance has often been the cause of failure.

Hot blast has been tried in Sweden, but led to no satisfactory result; however, the apparatus did not permit the pressure to be sufficiently increased at the same time; thus, too little oxygen passed into the converter; yet it seems that success ought to be attained if a sufficient quantity of hot air is used, and in case the slag-forming period is not too much shortened. With regard to the pressure of the blast, 10 lbs. per Rhenish square inch are applied in the Swedish, and 20 lbs. in the English process.

3. The converter lining has to answer two purposes, inasmuch as it is not only needed as support and for the lining proper, but at the same time for the formation of a slag. If it is considered that 10 parts of iron require from 2 to 4 parts of silicon for the formation of a basic slag, it is evident that the pig iron can only furnish a small part thereof, and that the larger part must be withdrawn from the furnace-lining. Owing to the high temperature, this is, of course, subjected to a great deal of wear, and must therefore consist of a silicious, fire-proof material. The best material discovered in England is "Ganister," a carboniferous sandstone occurring in the neighborhood of Sheffield, which, aside from silica, contains only one or two per cent. of alumina and oxide of iron. After being burned and ground, it is stamped in the converter in a moistened condition, and glazed by spreading salt on it and heating. This mass will last for 100 charges. In Heft (Carinthia) a mass of two-third quartz and one-half fire-proof clay from Blanskoe is used for the English converter, and for the Swedish from three-fourths to one-half quartz, with one-fourth to one-half fire-proof clay.

Mining Schools.

Few persons know how much it costs to educate a student for one of the technical callings. The expense of the embryo chemist, or mining engineer, is at least $500 a year to the school which he attends; and as fees usually range from $200 down to $75, it is plain that scientific schools are not money-making establishments. For a scientific department, added to a college already established, the expense of a student may be less, but no thorough school of special science can be maintained for a less sum per scholar, taking the average number of students in American schools, than that given above. Under these circumstances, it is worth while to read over the means by which the projectors of a Mining Institution at Barnsley, in Yorkshire, Eng., propose to support their school. The scheme proposed is to erect a school, with masters' residence and accommodation for a staff of teachers and professors, and a limited number of boarders. Class-rooms, reading and lecture-rooms, and other facilities are to be provided; and a sound, practical training for fitting miners' and pitmens' sons for conducting mines, together with a knowledge of chemistry, mechanical engineering, and other attainments, is proposed to be given by scientific lecturers, together with classes. A circulating library and other objects are set down in the programme, and are to be open to miners' and pitmens' boys who shall first have passed an approved examination. It is proposed to expend something like £30,000 to start the institute, which is to be supported by numerous owners giving a fraction per ton per half year, workmen a small sum per half year, and colliery owners a fraction per ton per hands employed per half year. As a number of representatives from collieries and iron works were present at a late meeting and discussed these measures, it is to be presumed that they were not found unsatisfactory. The idea of taxing iron at so much per ton is a good one, for the rate will be too small to add even an appreciable percentage to the present cost of producing that metal, and the contribution of each establishment will seem less made up in this way than if a round sum were to be demanded and discussed each year.

This school appears to be of that practical kind which would be so useful in this country, and which will undoubtedly one day make its appearance in each great center of mining and smelting activity.

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ROSSITER W. RAYMOND, Ph. D.,
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We learn from Boston that the meeting of the Institute, the report of which we shall commence to publish next week, was extremely interesting, and well though not largely attended. The social enjoyments of the occasion were made particularly enjoyable by the hospitality of the Boston Society of Natural History and the Institute of Technology, and particularly of Mr. BOUVÉ, President of the former Society, and of President ELLIOTT, of Harvard University. The delights of the social as well as the intellectual reunions of this meeting, and of the excursion to the Hoosac Tunnel, with which it concluded, will be reported, we trust, by the senior editor of this journal, who writes us that he is this week too busy enjoying himself to contribute any information on these subjects to our columns.

MR. CARR, the maker of the Selden Pump, illustrated by us last week, intends to send a number of his machines—five in all—to Vienna. One of these he has lately set up in his salesroom, 43 Cortlandt street, New York, and is now running. It will be kept at work in the Exhibition, and will be a good specimen of what Americans do in the way of mining apparatus. The interest in the Vienna Exhibition increases as the time for opening draws near. From England we learn that as many as 800 British exhibitors will have articles in the building, and about 300 of them represent the building, engineering, metal and similar trades.

Geological Survey in Pennsylvania.

We intimated, sometime ago, that a project for a new geological survey of Pennsylvania was under discussion, and pointed out that the constant labors of geologists on private account had resulted in the gathering of so many valuable facts that it was high time for a revision of the work over the whole field. Mr. J. P. LESLEY of Philadelphia, well known as a geologist of high reputation, has written a letter, in response to an invitation of Governor HARTRANFT, in which he discusses the necessity for the survey and lays out a preliminary scheme of work. His plan is to go over the State, county by county, mapping the country by odometer road surveys, and when good maps have been obtained, proceeding with the geological work. He does not think it advisable to work up the whole State at once, but complete five or ten counties a year, and publish the maps as fast as made. The geological formations could be put in as fast as studied. When complete, the whole could be issued with a few pages of text, forming a concise geological and topographical guide to Pennsylvania, which could not fail to be of great value.

The first survey of the State was made in 1836-41, and the second in 1852-3. Since the latter date, the discovery of oil has been made, and the 20,000 borings attendant upon it have nearly all been suffered to proceed without adding to geological knowledge, as they should have done. Great numbers of trial shafts have been sunk in the coal regions, ore beds have been opened, and these too have passed without record, and are now beyond the ability to help the student of the earth's strata. Mr. LESLEY may well bewail the fruitlessness for science of all these undertakings, and use them as a powerful argument for the survey.

The estimated cost of the work is $47,000 a year, and if it can be done for anything like $50,000 a year, we trust the Legislature of the State will not hesitate about ordering it. There is no need, at this day, to argue in favor of such labors. That question has long been settled for intelligent men. We believe there are men in the oil region who are opposed to the survey on the ground that the geologists will develop some "oil belt" beyond the limits of which oil will forever after be absent. It is funny to think that these gentlemen are apparently under the impression that the distribution of oil has no boundaries so long as the scientific gentlemen are kept out of the field, though it may be found to be quite limited, if they are permitted to peer around too closely. But against prejudices of this kind it is hopeless to argue, and argument should not be needed. We look to the action of the Pennsylvania Legislature in this matter with feelings of the liveliest anticipation

Water-Burning Furnaces.

WE believe some experiments, made in San Francisco, to accomplish the combustion of water, have attracted a good deal of attention, and led many to think that it could be accomplished. Of course, being a water-burner, the furnace is announced as on "an entirely new principle," although the discussions upon this subject, which have been so frequent in the press of all kinds—religious, technical and general—ought to have apprised the world that the principle aforesaid is not a new one. However, our present purpose is to speak of water-burning as an economical proceeding, and not to throw the cold fluid over any inventor in particular.

It is well known that many inventors and others believe that there is a great field in the future for contrivances which are to use water as fuel, and that these views are opposed by scientific men. But it is also commonly supposed that the inventors assert that water can be burned, and that scientific men deny the fact. That supposition is, however, incorrect. Scientific men with one voice say that water can be burned, but they make the point that it cannot be burned *economically*. They therefore say that those who talk of water as the poor man's fuel because it is found everywhere and is everywhere cheap, neglect to count up the cost of turning water into fuel. The fact is, that to make water into fuel, other fuel must be burned. It is plain that if the fuel burned costs more than the value of the fuel produced from the water, the process is not economical. If the two fuels have precisely the same value, the process is also not economical, because the manipulations would cost something; and besides, why take the trouble to transform one fuel into another which is no better?

We will not at present discuss the question of the relative value of the fuel burned and the fuel produced in these water burning furnaces. The testimony of scientific men is against them, and we will leave that question there. Our object is to bring forward the fact that water cannot be turned into a fuel unless some other combustible is employed to accomplish the work. We do this because we know that the impression has gone out that these water burners are just the things for isolated regions when fuel and labor are scarce. If it is known that the miner, who is not already supplied with a combustible, cannot hope to make anything of the fuel kind out of water, we think that a good deal of the glamour which surrounds this subject will be taken away.

In San Francisco the fuel used to decompose the water was coal tar. But how is the miner in Wyoming or Nevada to get coal tar at any fair cost? Still, charcoal, coke, coal, wood and peat are just as serviceable as coal tar. But who would use water when he already had these fuels at his command? Whatever water burning may do for cities that can gather from factories and gas works refuse material that will serve as a combustible, it certainly has no future for remote regions where the only combustible is scarce and dear. When our friends, the miners, have ruminated on this part of the subject, we think they will be in a condition to listen patiently to the reasons that scientific men have to give for their lack of faith in water burning.

The Condition of the German Mines.

Our contemporary, the *Iron Age*, has exclusive information of the most remarkable disaster, it is safe to say, which ever befell the mining world. Speaking of the exportation of American ores it says:

"Of these ores but few have found their way into Germany, partly because of the more intimate commercial relations existing between this country and Great Britain, giving the latter an advantage, and partly because the supply of German ores was sufficient to employ the smelting works of that country to their capacity. Suddenly, however, the mines at Adreasberg, in the Hartz Mountains, began to give out, and as the transfer of the smelting works to some other locality is out of the question, owing to the fact that the workmen and their families are located there in permanent settlements, the managers of the Adreasberg works have turned their attention to the importation of foreign ores. The Royal Saxonian mines at Freiburg were the next to give out suddenly, and later, the managers of the great Mansfield mines, at Eisleben, have reached the conclusion that silver-bearing copper ores would have to be added to their own ore product, if their smelting operations are to be carried on to the best advantage. Under these circumstances, the three mining companies, the Royal Prussian at Clausthal, the Royal Saxonian at Freiburg, and the Mansfield at Eisleben, arranged for common action in the matter of securing larger importation of American ores, committing to the management of the Prussian Company the

business part of the undertaking. This arrangement promised great advantage, for the reason that the three companies could take any kind of ores between them: the Clausenthal all the lead ores, either silver-bearing or pure, the Freiburg all ores containing antimony or arsenic, and the Mansfield all copper ores."

What! the Hartz and Saxony at one blow? That is dreadful—or would be if it were true. But, fortunately for the hundreds of thousands of human beings who are directly or indirectly dependent upon those two great mining fields, it is far from the truth. The Mansfield region has ore enough untouched to maintain its activity for 150 years. The Clausthal mines cannot look so far ahead, but they never were so active as now, and though that activity is said to be kept up at an unwarrantable expense of their resources, their outlook is anything but disastrous. As for Freiberg, the paper finished in the last number of the JOURNAL contained in its few historical notes enough to show that so far from "petering out" the best authorities are looking for a renewal of the former high grade of ore within a time probably not very far off. If this improvement comes, and is coupled with the present enormous extraction, the mines of Freiberg will have a value the comprehension of which must stagger the mind. The latest data we have of the yield of these three districts are those of 1869, in which year the mines of the upper Hartz yielded 14,646 tons of ore, Freiberg 116,643 tons, and Mansfield 173,350 tons—a total of 304,638 tons. Certainly this picture is a different one from that presented by the *Age*.

The truth in regard to the treatment of foreign ores in these smelting works is, that this is an old practice, which has latterly been expanded in obedience to the wishes of the foreign miners. Producers of ore have good reason to be dissatisfied with British smelting works, which purchase by methods that none but a Cornishman can comprehend, and whose price, when it is finally figured out, is less than that given in Germany. The smelting works in the latter country buy according to the ordinary weights or measures in use in the country where the ore is mined, pay a good price for it, and treat it with the greatest care. The natural consequence of possessing so many virtues is, that they are flooded with ore, and are now aiming rather to repress than encourage the import of foreign ore. We hope to be able shortly to print a statement of what they have received from abroad during the past six months.

The Iron Manufacture of 1872.

The Pig Iron Manufacturer's Association had a meeting in New York on Wednesday, Feb. 19, at which 31 companies were represented. The Secretary's report, of which we shall give a very full statement next week, was an interesting and important document. It showed that the make of 1872 amounted to 2,388,250 tons, divided as follows: Anthracite 1,197,010; Raw bituminous and coke 712,500; Charcoal 478,500. During the year 109 furnaces were built, and 39 projected, and 43 rolling mills built and 11 projected. This gives a total of 199 new establishments; and on looking over the list, any one familiar with what is going on in some of the States mentioned will see that it is incomplete. The gratifying thing about this exhibit is, that the increase of rolling mills, which stand toward blast furnaces in the relation of consumers, has kept pace with the number of blast furnaces themselves. Allowing 327,000 tons for the increase of pig produced, we have 50 new mills and an expansion of the existing mills amounting to 30 per cent. of their former capacity, to make away with the increase.

Mr. DUNLAP calculates that the country used last year 4,054,618 tons of iron in 1872, including 400,000 tons of American scrap. In fact, of the above total one-tenth was American scrap, three-tenths imported iron, and six-tenths American pig. This was consumed as follows: In castings 1,103,000 tons; in railroad supplies 2,478,500, and in other wrought iron products 730,000 tons. Total 4,311,500 tons, which balances the other side of the account sufficiently near for approximate calculations.

The increase in ore production is put at 150 per cent. of that for 1870, the present extraction being about 6,400 000 tons.

Five Bessemer works are in operation, and used in 1872 125,361 tons of pig. The Bessemer rail production was about 90,000 tons. At least 4 new establishments are projected.

This report, while exhibiting a most flattering picture of our progress toward supplying our own iron, is still more encouraging in the proof it gives that the very large extension of our productive power within late years has not only not overdone the market, but has fallen very far short even of answering the needs of the country.

The Strike in Wales.

This great struggle continues and seems to gather bitterness with time. As is so often the case there appears to be a great proportion of the men who are willing and probably anxious to resume work, but they are kept in training by the well known agencies of trades unions. An effort was made to have a vote by ballot on the question to resume, but the leaders were able to persuade most of the men to keep away from the polls, and though the result of the vote was an immense majority in favor of submission, the whole number voting was too small to carry weight. As an instance of the bitter feeling of the men, the *Colliery Guardian* mentions the fact, that some pits belonging to the Plymouth Iron Company are in danger of being flooded unless men can be found to cut sufficient coal to keep the pumping engines going. Placards were accordingly posted, offering eight shillings each per day to do this work, but no dozen men could be found to undertake it, although there must be thousands who, with their families, are on the verge of starvation, and although the flooding of the pits would be a disaster the consequences of which would long outlive the strike itself.

Mr. BROGDEN has endeavored to get around the difficulty by removing the cause of the strike. He proposes that the masters shall pay the men their old wages, and that the latter shall work in a way which will be more productive and economical than the old method. This would remove the cause of the dispute, and at the same time confer a lasting benefit upon the region. The change he advocates is the introduction of the double shift system. By this system two relays of men work seven hours a day in cutting coal, other men raising the coal and performing the necessary repairs within the working hours. Mr. BROGDEN gives his reasons for proposing this change as follows:

"The same quantity of coal can be raised with half the area of underground working places open; and the diminution of expenses in repairing, timber, charges for pumping, ventilation, &c., is necessarily very great. The plan has long been adopted in the North of England with the greatest success, and has the merit of extracting a larger quantity of coal, and in better condition, from the area worked than can be done with the single shift system. But it has advantages still greater in the prevention of accidents and in increased security for the men. There would be only half the number of men down the pit at one time, and, if accidents through explosions should occur, the risks are applied to only one-half the number. The area to be inspected and kept in repair would only be one-half, and the inspection and repair could be much more efficiently done."

The miners, however, do not seem to favor this method of adjustment.

Scotland has been more fortunate than Wales. The number of blast furnaces going at the end of the year was 115, and, in the course of a fortnight afterwards, they had been reduced to eighty-eight. Within the next week or two, a considerable number were re-lighted, and more are expected to follow in course. This has been brought about by the great majority of the miners having returned to their work; for the most part, at the masters' terms. In one case the settlement was accomplished by taking a vote of the miners by ballot, on the question to resume work.

The Clarence Ironworks.

The Clarence Ironworks are situated on the north or left bank of the river Tees, immediately opposite the works of Messrs. BOLCKOW, VAUGHAN, and Company, of Middlesbrough. They were commenced in 1854 by the firm of Messrs. BELL Brothers. There are three members of the firm—Mr. ISAAC LOWTHIAN BELL, of Newcastle and Washington, the well-known metallurgical chemist; JOHN BELL, who is equally well known as a mining engineer and who undertakes the actual management of the Port Clarence Works; and Mr. THOMAS BELL, of the Walker Ironworks. The site of the works at Clarence was originally a tolerably large lake, through which the old channel of the river Tees flowed onward to the sea, which is only a few miles distant. When the Tees Conservancy Commissioners undertook the diversion of the original channel of the Tees, with the object of straightening and improving it, the West Hartlepool Railway Company acquired the wide expanse of land surrounding the Clarence Works, which was then almost entirely covered by water. Fifteen acres of this land the company sold to the Messrs. BELL, when they selected Clarence as the site of their intended works. As the greater part of these fifteen acres was at that time under water, there were those who thought that it was anything but a suitable *locale* for an ironworks. But the Messrs. BELL saw a long way ahead. In the first place, they fixed upon the site because it was nearer to the South Durham coal fields than the opposite bank of the Tees, where all the blast furnaces in Cleveland that preceded those of Clarence Works had been erected; while they were not more remote from the sources of ironstone. By degrees, the site of the works was extended until it now comprises 200 acres of ground, or more than sufficient for the deposit of the slag from the furnaces for many years to come. Herein there lies a double advantage. Some of the works in Cleveland have nearly exhausted all their available space for the tipping of the slag, and they must either acquire valuable building ground for the purpose, or remove it, at a more or less considerable expenditure of labor, time, and money, to a distance. The Clarence Works, on the contrary, have this vast tract of waste and useless land available for an indefinite period of time, and while using it for the tipping of slag, the owners are reclaiming it at the same time.

The original plan of the construction of the Clarence Works comprised only three blast furnaces, a little over 60 ft. in height. Since then, however, five more furnaces have been added—the last two have been built in 1864—and the old furnaces have been raised until the whole eight now attain a uniform altitude of 80 ft. The diameter of the boshes varies from 17 ft. to 25 ft. All the furnaces are in one row, opposite to and distant about thirty yards from which it is on the cards to erect two more furnaces 80 ft. high and of the widest diameter of boshes just stated—namely, 25 ft. The site for the new furnaces has been selected with a view to the ultimate extension of the works to double their present capacity, although the full consummation of the idea may be an event of remote occurrence. The construction of the two furnaces now projected will, however, be commenced forthwith,

The arrangement of the Clarence Works is, perhaps, as near perfection as anything that has yet been attained in Cleveland. There are altogether six blast engines, contained in two separate houses, which are divided from each other by an area about 200 yards square. It is within this area that the boilers are contained, so that there is little waste of steam in passing from the point where it is generated to the engines. The engines vary in kind and

power. Four of them are beam engines, made by LOSH, WILSON, and BELL, and and two are vertical engines, supplied by Messrs. COCHRANE, GROVES, and Co., of Middlesbrough. The largest engines have steam cylinders 3 ft. 8 in. diameter, the blowing cylinders being 8 ft. In another part of the larger engine house, there are three condensing engines, used for condensing the steam as it passes from the blast engines, and one of Sir WILLIAM ARMSTRONG's hydraulic accumulators, by means of which the furnace hoists are worked. The cylinder of this immense apparatus contains about 100 tons of water. There is another hydraulic apparatus of the same kind, and used for the same purpose, at the other end of the works. There is no uncertainty as to the efficiency with which these huge and cumbrous-looking appliances do their work; but they are not common in the Cleveland district, chiefly because of their great cost. Simpler and less expensive machinery is the rule. There are four hoists at work—two to each furnace. The hoists are entirely constructed of iron, and have a light and tolerably graceful appearance, compared with the massive brick structures that are to be met with at other works. A gangway runs along the top of the entire line of furnaces, all of which are close-topped. Every care is taken to effect the complete utilisation of the furnace gases, which are taken off immediately below the gangway and carried to the heaters and boilers. The smaller furnaces are provided with four tuyeres; the larger with five. All the furnaces are completely cased in iron, contrary to the rule in Cleveland, where they are usually only hooped. It is argued by those who prefer the latter system—which, by the way, is the more economical—that they can more readily see when any part of the furnace is giving way; while for the former plan it is claimed that it renders the furnace much more durable. The heating stoves are of the usual kind, there being about twenty pipes in each. Neither in the heaters nor in the boilers is there any coal used, the waste furnace gases being sufficient for their supply. One of the many ways in which labour is economised may be worth mentioning. At the back of the line of furnaces there is a gangway raised about 20 ft. from the ground, along which the railway trucks loaded with ironstone are carried on rails. At regular distances opposite each furnace there are trap-doors in this gangway, which are opened so as to allow the ironstone to drop from the railway wagons into the barrows below. The barrows are then wheeled to the hoist close at hand, there being thus no necessity for filling them by hand. Between this gangway and the furnaces there are five mine or calcining kilns, where the stone is burned with a view to converting it from a carbonate to an oxide of iron before it enters the furnace. For this purpose about 1 cwt. of coal is used to the ton of ironstone. These kilns are of cylindrical shape, and are made of fire-brick, with an outer casing of iron similar to the furnaces. There are other thirty kilns on the old-fashioned principle on a level with the gangway already named, so that the ironstone is dropped into them with a minimum of manual labor. It is intended in course of time to abandon these square kilns in favor of the newer form, which, although considerably more expensive as regards first cost, are much more economical in the results of their working. The essential difference between the two is that in the older or square-shaped kiln there is but one opening, and the stone is removed therefrom with considerable trouble, whereas in the other, being of circular form, there are several openings all equally convenient for the workman, who has only to draw aside a door and allow the calcined stone to drop into the barrows below. The circular kilns contain from 400 to 500 tons of ironstone per charge.

In the blast furnaces, the temperature of the blast is heated to between 1,000 and 1,200 degs. From the larger sized furnaces the yield obtained is about 30 tons of pig per shift. The total make of the works is about 400 tons of pig iron per day of twenty-four hours, or 2,800 tons per week. The weekly consumption of ironstone is from 8,000 to 9,000 tons; of coke, about 3,000 tons; of limestone, 1,600 tons; and of coal, 500 tons—the total quantity of raw material consumed being thus about 14,000 tons weekly. The proportions used to make a ton of pig iron may be said to average 3½ tons of ironstone, 23 cwt. of coke, and 12 cwt. of limestone. The production of slag is enormous—averaging eight balls per furnace per shift. Nearly the whole of the forge iron made at the Clarence Works is used in the mills in the neighborhood; but the foundry iron, made for castings, is chiefly exported. The Messrs. BELL have the most ample facilities for transport by the Clarence branch of the North Eastern Railway, and by the Tees, from the channel of which the works are only distant about 500 ft. The works are intersected by railway lines, and at their northern extremity there are workshops where all the repairs necessary to the machinery are executed. The site of the works has a frontage to the Tees of fully half a mile. This is, of course, only the navigable part of the channel.

The Messrs. Bell Brothers have large ironstone royalties, extending to fully 2,500 acres. Their principal mines are at Normanby, where they commenced to work the stone in 1853; at Skelton, where they opened out a drift in 1857; and at Brotton, where they leased a royalty in 1863. The two older mines are nearly exhausted; and will not certainly last for more than twelve years longer. At Normanby, ventilation is secured for the mines by a steam fan of the largest size; and at Skelton and Brotton, the firm are about to provide other two fans on the Guibal principle, made by the Grange Iron Company, near Durham. From their ironstone mines, the firm raise about 2,700 tons daily. This quantity is not unfrequently exceeded. In addition to their works at Clarence, the firm supply ironstone to the Walker Ironworks, the Washington Works, and the works of Messrs. SWAN, COATES, & Co., Middlesbrough.

All the coal necessary for their own purposes is raised by the Messrs. BELL, who hold about 3,000 acres of royalty, at Kirsdale, South Brancepeth, and Browney. Over the whole royalties, there are from 1,800 to 2,000 tons of coal raised daily. At Browney, where the coal is held under lease from Lord Boyne, three new pits are in course of being sunk. The coke used at the furnaces is made at the collieries, where ovens are erected for that purpose.—*Colliery Guardian.*

MINING SUMMARY.

California.

THE SAN DIEGO MINES.

From the San Diego *Union* of Jan. 23:

We copy in full the following letter from Julian City to the Sacramento *Record*, as the most interesting and most accurate account of the mines of San Diego County that has been printed in any newspaper beyond our city. The people of San Diego are, of course, familiar with the facts stated, which have been presented at length in the columns of the *Union*; but we give this letter place because it contains in a condensed form the prominent facts concerning our mining section, from the date of the discovery of gold to the present time, and in this regard will be found a valuable summary of information for readers at a distance:

JULIAN CITY, December 24, 1872.

Nearly three years have passed since the first discovery of gold-bearing quartz in the mountains northeast of San Diego. One Bickers was wandering in the hills in search of game on the 22d of February, 1870, when he stumbled on a piece of quartz; he picked it up, and lo! it was rich in gold. In honor of the day he named it the "George Washington Lead." The news of the discovery soon spread, and in a few weeks there was a rush to the new mines. The whole country was staked off in claims; arastras were put in motion; those who could do no better pounded their ore out in iron mortars—and for the time nothing was talked of but gold. Indeed no small quantity of bullion was obtained by these rude processes of working. Several thousand dollars worth of gold, the proceeds of the mortar-crushing, was sold to the merchants here during the first few weeks. Then came a small quartz mill to do custom work, and this tested the quality of the leads. Hitherto quartz had been "picked out" of pockets for mortar-crushing and the arastra. Now commenced the regular development of the veins of ore. The "Washington" mine—richest of all at the outset—was soon worked out. (The claim is still worked in order to hold it, but does not rank with the prominent mines.) Later discoveries developed permanent ledges, showing better and better pay ore the deeper the shaft went down. Of these the "Owens" and the "Helvetia" are the leading mines in the Julian district at this time—having been thoroughly worked—but there is a dozen other claims of excellent promise, from which there has been a steady yield. Three quartz mills are kept pretty constantly at work here crushing custom ore. One mill (DeFrees & Co.'s) gives most of its time to working ore from the "Owens" mine, in which the proprietors are owners.

THE STONEWALL MINE AND MILL.

About eight miles southeast of Julian is situated the celebrated Stonewall mine, owned by Messrs. Frary, Farley & Co. This is undoubtedly the richest mine in the county. The proprietors have the best mill in Southern California; their mine is worked systematically and has been well developed; the ledge increases in richness as it is opened. This mine is located at the base of the Cuyamaca mountains, the first shaft having been sunk in a flat within a short distance of a wide lagoon, whence a supply of water for the mill is drawn in winter. A lot of pumping machinery for bringing water from this lagoon has just been brought on the ground. I have never visited a mine where the word "thorough" was more appropriate in describing the management than here. The mill runs night and day, and the yield of bullion is steady. The proprietors decline to state the average amount, but I may say that they have over $100,000 worth of machinery, etc., on the premises that has been paid for out of the mine during the last eighteen months. This speaks for itself.

THE CUYAMACA GRANT.

The Stonewall mine is covered by what is called the Cuyamaca Grant—one of those old Mexican grants that inevitably come to the surface on the discovery of valuable mines. It is always the case with these grants that the boundaries are "nowhere in particular and everywhere in general," being of an elastic quality which permits stretching in any given direction. The Cuyamaca Grant has always been supposed to be south of the Julian District, but when it was surveyed a year or two ago its lines took in all that district. The proprietors of the Stonewall mine admit that *their* mine may be honestly within the grant, and they have obtained a twenty-year lease of the ground. But nobody who is acquainted with the geography of the county—none of the "old residents," of twenty-five or thirty years standing—believe that the grant can possibly fairly include the Julian mines. The miners contested the survey and the Surveyor-General decided in their favor; but their lawyers were negligent in attending to their case; the proper papers were not filed at Washington, and so the case came back for a rehearing. Testimony is now being taken at San Diego. The miners have arranged an association here, to carry on the contest, and have strong hopes of success. The evidence is all in their favor, and with proper management on the part of counsel they must win.

JULIAN A RISING TOWN.

This is "a rising town." It is in itself the best evidence of the richness of the mines. I came here just after the discovery, in the winter of 1870, and found a broad plateau covered with snow; there was a thick growth of oaks, and under the trees were pitched the tents of the prospectors; here and there log huts were built. Now there is a thrifty little village. All of the velopment these mountains has been accomplished without the aid of capital from abroad. Julian has been built—the population of the whole section has been supported during the last three years—the mines have been opened and worked—the mills have been purchased and erected—solely and entirely with the gold that has been here taken from the earth. I challenge the quartz-mining history of the State or coast to produce a parallel case.

THE BANNER DISTRICT.

I must not omit some account of this latest discovery, and as some claim, richest quartz district. It adjoins Julian, being distant but three miles from the town. The mines are in the San Felipe canyon. You descend abruptly some eighteen hundred feet into this canyon, passing from winter to summer. In the fall, when the

cold blasts blow over the Julian hills, chilling you to the bones, you may in half an hour's walk go down into the region of sunshine and warmth. The canyon runs out to the Colorado desert, in about ten or twelve miles from the mines. Here there are also three mills, which are kept running most of the time. Of the mines, the most prominent is the Golden Chariot; it has a very wide ledge—four feet—and the ore has averaged over $200 per ton. Machinery will soon be on the ground for a mill. Hitherto the ore has been packed up the canyon to Whitney's mill on burros at great expense. Miners of experience assert that the Golden Chariot promises to become one of the richest mines in the State, and that it bids fair to rival the famous Hayward mine of Amador. Next in importance is the Redman mine; then the Ready Relief, the Antelope and the Madden; and there are many other very promising mines that I cannot now name.

American Institute of Mining Engineers.

OFFICIAL BULLETIN.

Announcements to Members and Associates.

I. The next meeting of the Institute will be held Tuesday, February 18, 1873, in Boston, Mass. Prof. T. STERRY HUNT, and Prof. W. H. PETTEE are the local Committee of Arrangements. The Local Committee announces that the meetings will be held in the building of the Boston Natural History Society, Berkeley street, corner of Boylston street. Members will make the Parker House, School street, their head-quarters. The committee has been in communication with the engineers and contractors of the Hoosac Tunnel, and have received the kindest assurances of welcome to the members. It is expected that the meeting will close with a visit to the tunnel, taking that great work on the return home.

II. All members and Associates who pay their dues ($10,) for each current year, strictly in advance, will have sent to their address, regularly and weekly, the ENGINEERING AND MINING JOURNAL, which is the organ of the Institute, and will contain the proceedings and transactions, and all important papers read before the Institute and all notices of meetings. Back numbers cannot, as a general rule, be sent.

Those members and associates who have not paid their dues for the current year, are requested to do so at once. Money may be sent in postal orders, checks or bank bills, to the Secretary, THOMAS M. DROWN, 1123 Girard street, Philadelphia, Pa.

III. It is expected that the more important papers, read before the Institute, and the debates thereon, will be published in annual or occasional volumes to which those Members and Associates will be entitled who have paid their dues.

IV. All authors of papers are requested to notify the Secretary in advance of the meetings, giving the subject and length of their papers. Attention is also called, in this connection, to Rules 12 and 13.

V. The ninth rule has been amended, so that there will be hereafter three meetings a year, in February, May and October.

THOMAS M. DROWN, Secretary.

1123 Girard street, Philadelphia, Pa.

Advertisements.

111th Auction Sale.

90,000

TONS SCRANTON COAL.

On WEDNESDAY, FEB. 26th, 1873.

NEW YORK, February 19th, 1873.

The Delaware, Lackawanna and Western Railroad Company will sell, by MESSRS. JOHN H. DRAPER & CO., Auctioneers, at the Company's Sales Room, 26 EXCHANGE PLACE, corner of William Street, NEW YORK, on WEDNESDAY, FEBRUARY, 26th, at 12 o'clock, noon,

175,000 TONS

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COAL, FROM THE LACKAWANNA REGIONS,

of the usual sizes, deliverable at their Depot, Elizabethport, N. J., during the month of March, 1873.

The sale will be positive; each lot put up will be sold to the highest bidder; no bids, in any form whatever, being made for account of, or on behalf of the Company. The conditions will be fully made known at the time of sale.

TERMS: FIFTY CENTS PER TON, payable in current funds, on the day of sale, and the balance, within ten days thereafter, if required, at the office of the Company.

SAMUEL SLOAN, President.

MISCELLANEOUS.

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(Late Professor of the N. Y. Medical College, Mechanics, etc., at the Cooper Institute, and of Industrial Science at the Girard College, Philadelphia.)

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ISIDOR WALZ, Ph. D. ANALYTICAL AND, CONSULTING CHEMIST.

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Especial attention given to Purchase and Sale of Mines; a Examination of Title and Certificates thereto.

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Dec. 31-3m

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AMES.

EMERY CLOTH BEST QUALITY. TRADE A MARK. **EMERY PAPER.** LOWEST PRICES

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Feb.4.4t

"ENGINEERING."

"The leading Engineering Journal of the world," indispensable to every Civil, Mining, or Mechanical Engineer, can now be obtained post-paid at $9 30 currency, by remitting Post Office order to NEW YORK OFFICE "ENGINEERING," 752 Broadway.

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No. 5 Nassau st., New York, Jan. 28, 1873.

The CHESAPEAKE and OHIO, the CENTRAL and WESTERN PACIFIC BONDS, all of which have been negotiated by us, we believe to be among the best and most desirable Investment Securities in the market, which in time must become very scarce, especially as the Government will probably, during the year, pay off, in gold, another large lot of FIVE-TWENTIES, and issue in their place FIVE PER CENT. BONDS.

The CHESAPEAKE and OHIO SIX PER CENT. GOLD BONDS, the total amount of which is only $15,000,000, are secured upon a property worth $35,000,000 to $40,000, 000, and are fully equal in intrinsic value to the CENTRAL PACIFIC BONDS. They are issued in denomin tions of $100, $500, and $1000, Coupon or Registered, and at their present market price (86 and accrued interest), are very desirable.

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The WESTERN PACIFIC SIX PER CENT. GOLD BONDS amount to $2,735,000. This road is now consolidated with the CENTRAL PACIFIC, and the payment of its bonds, principal and interest, is assumed by them. Their market price to-day is 90¼ to 91. As they have recently been introduced on the Stock Exchange, we expect to see them rapidly rise to the price of CENTRAL PACIFICS, being substantially the same in character and value.

We buy and sell, as usual, Government Bonds, receive deposits, on which we allow interest; make collections, and conduct a general banking business in all its branches.

Feb. 4.tf FISK & HATCH.

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Stock Constantly on Hand of any weight and pattern, and sold in lots to suit purchasers.

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Nov. 21:1y

MISCELLANEOUS.

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Nov 19:1y

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New Patterns, of any desirable weight, made to order on Short Notice.

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Nov. 26:3m

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Nov. 19:1y

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May 17:1y

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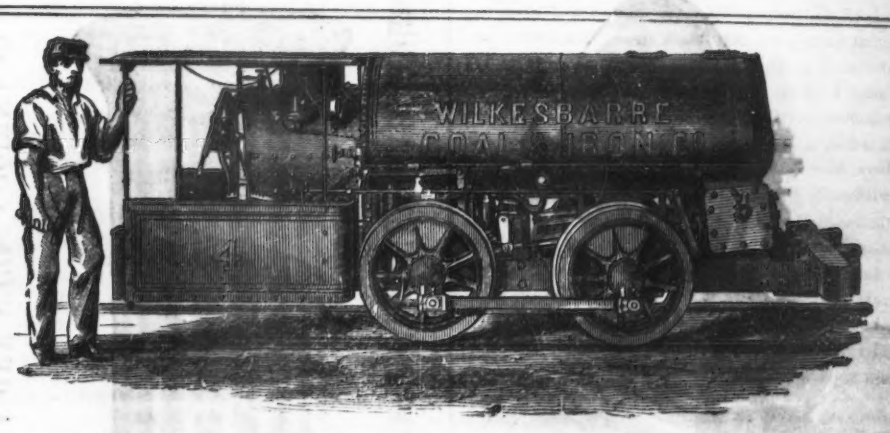
Jun28:1y SPIEGELEISEN CINDER FOR BLAST FURNACES.



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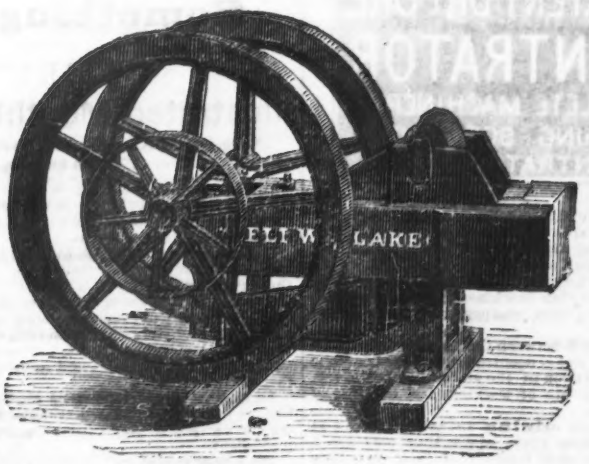

The office of this Machine is to break Ores and Minerals of every kind into small fragments, preparatory to their further comminution by other machinery.

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Illustrated circulars, fully describing the machine, with ample testimonials to its efficiency and utility, will be furnished on application, by letter to the undersigned.

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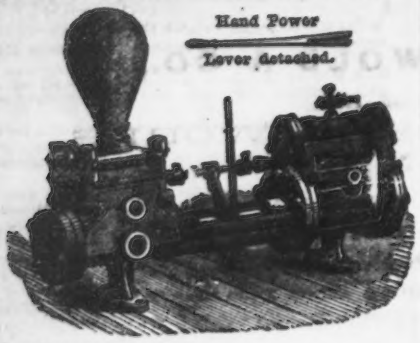

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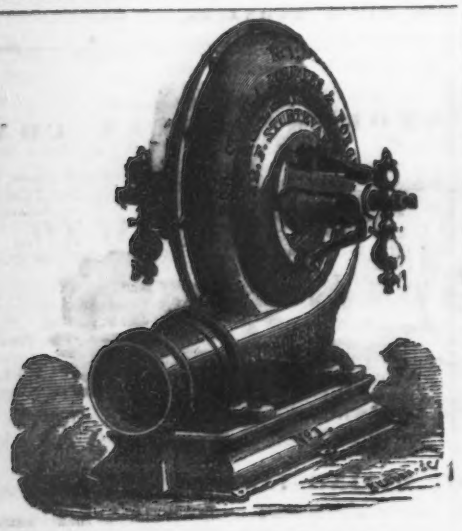

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Advice in Patent Law given free. mar 8:tf

MISCELLANEOUS.

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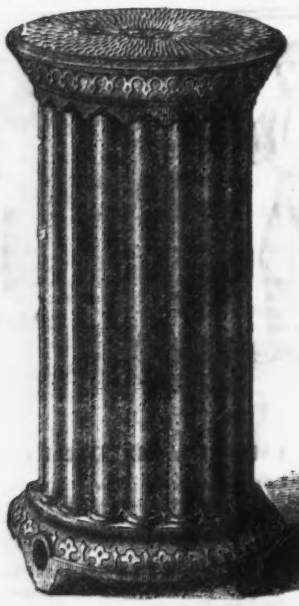

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nov29-1y

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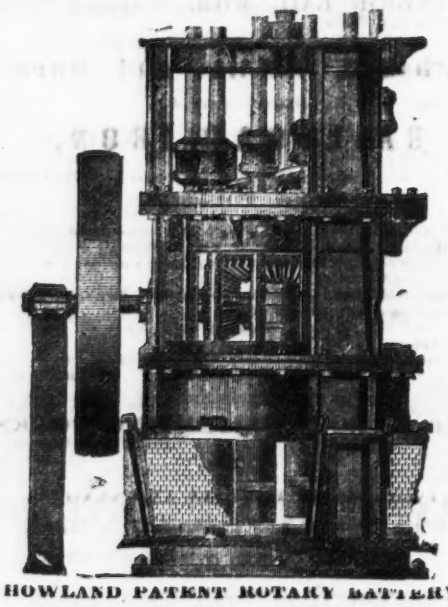

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MISCELLANEOUS.

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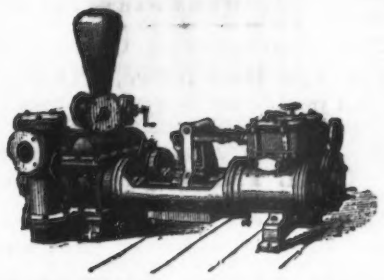

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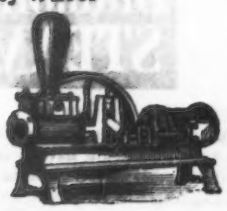

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